

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

ROBERT BOSCH LLC,

Plaintiff,

V.

PYLON MANUFACTURING CORP.,

Defendant.

C.A. No. _____

JURY TRIAL DEMANDED

COMPLAINT

Plaintiff Robert Bosch LLC, through its attorneys, for its complaint against defendant Pylon Manufacturing Corp., avers as follows:

1. This action arises under both the patent laws of the United States, Title 35 of the United States Code (for example, 35 U.S.C. §§ 271, 281, 283, 284, and 285), and the Lanham Act, Title 15 of the United States Code section 1125, as hereinafter more fully appears. This Court has jurisdiction over the subject matter of the action pursuant to 28 U.S.C. §§ 1331 and 1338.

2. On September 25, 2001, United States Letters Patent No. 6,292,974 (attached as Exhibit A) were duly and legally issued for an invention in a wiper blade. Plaintiff is the owner of those Letters Patent.

3. Defendant has infringed and still is infringing those Letters Patent directly and indirectly by making, importing, offering for sale, using, and selling wiper blades embodying the patented invention, such as the Michelin brand Optimum, Radius, and Symphony products, marketed as manufactured under license by Pylon, and will continue to do so unless enjoined by this Court.

4. On January 13, 2004, United States Letters Patent No. 6,675,434 (attached as Exhibit B) were duly and legally issued for an invention in a wiper blade. Plaintiff is the owner of those Letters Patent.

5. Defendant has infringed and still is infringing those Letters Patent directly and indirectly by making, importing, offering for sale, using, and selling wiper blades embodying the patented invention, such as the Michelin brand Optimum, Radius, and Symphony products, marketed as manufactured under license by Pylon, and will continue to do so unless enjoined by this Court.

6. On September 20, 2005, United States Letters Patent No. 6,944,905 (attached as Exhibit C) were duly and legally issued for an invention in a wiper blade. Plaintiff is the owner of those Letters Patent.

7. Defendant has infringed and still is infringing those Letters Patent directly and indirectly by making, importing, offering for sale, using, and selling wiper blades embodying the patented invention, such as the Michelin brand Optimum, Radius, and Symphony products, marketed as manufactured under license by Pylon, and will continue to do so unless enjoined by this Court.

8. On December 27, 2005, United States Letters Patent No. 6,978,512 (attached as Exhibit D) were duly and legally issued for an invention in a wiper blade. Plaintiff is the owner of those Letters Patent.

9. Defendant has infringed and still is infringing those Letters Patent directly and indirectly by making, importing, offering for sale, using, and selling wiper blades embodying the patented invention, such as the Michelin brand Optimum, Radius, and Symphony products,

marketed as manufactured under license by Pylon, and will continue to do so unless enjoined by this Court.

10. Plaintiff has given notice to Defendant of its infringement.

11. Defendant's infringement has been and is willful.

12. Plaintiff developed the technology disclosed and set forth in United States Patent Nos. 6,292,974, 6,675,434, 6,944,905, and 6,978,512.

13. Defendant has made and is continuing to make false statements in commerce about the origin of Defendant's wiper blades embodying the patented invention. For example, Defendant prominently features on its website, www.pylonhq.com, the statement that "Michelin's expertise... has inspired the development of a high performance, frameless all-weather wiper blade with many innovative features and benefits, including... Advanced Frameless Design... [and] Integrated High-Downforce Spoiler." Defendant further states on its website that "The latest Michelin wiper blades on the market are all new and improved... adding functional features such as spoilers for improved wiper performance." Defendant's statements are false and likely to mislead the trade and/or public into believing that the technology employed in the Michelin brand Optimum, Radius, and Symphony products, marketed as manufactured under license by Pylon, was developed by Defendant, and not developed by Plaintiff. Defendant's statements constitute false or misleading descriptions of fact, and/or false or misleading representations of fact in commercial advertising or promotion that misrepresent the true nature, characteristics and qualities of Defendant's goods. Accordingly, Defendant's activities constitute false advertising in violation of 15 U.S.C. § 1125(a).

14. Defendant's acts of false advertising have materially injured Plaintiff, and will continue to do so unless enjoined by this Court.

15. Defendant's acts of false advertising have been and are willful.

WHEREFORE, Plaintiff demands an injunction against continued infringement and acts of false advertising, an award of damages, an award of treble damages, an award of attorneys' fees, an assessment of interest and costs against Defendant, and such other relief as the Court may find just and proper.

JURY DEMAND

Plaintiff demands a trial by jury.


Respectfully submitted,

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878242 / 33181

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EXHIBIT A



US006292974B1

(12) **United States Patent**
Merkel et al.

(10) **Patent No.:** US 6,292,974 B1
(45) **Date of Patent:** Sep. 25, 2001

(54) **GLASS WIPER BLADE FOR MOTOR VEHICLES**

3,418,679 * 12/1968 Barth et al. .
3,879,793 * 4/1975 Schlegel .
5,546,627 * 8/1996 Chen .

(75) Inventors: **Wilfried Merkel, Kappelrodeck;**
Wolfgang Leutsch; Thomas Kotlarski,
both of Buehlertal, all of (DE)

FOREIGN PATENT DOCUMENTS

1 247 161	1/1970 (DE) .	
2311293 *	9/1974 (DE)	15/250.43
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2440179 *	11/1975 (DE)	15/250.43
316114 *	5/1989 (EP) .	
2199302 *	4/1974 (FR) .	
1429820 *	3/1976 (GB)	15/250.43

(73) Assignee: **Robert Bosch GmbH, Stuttgart (DE)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/284,398**

* cited by examiner

(22) PCT Filed: **Jul. 9, 1998**

Primary Examiner—Gary K. Graham

(86) PCT No.: **PCT/DE98/01893**

(74) *Attorney, Agent, or Firm*—Michael J. Striker

§ 371 Date: **Jun. 11, 1999**

§ 102(e) Date: **Jun. 11, 1999**

(87) PCT Pub. No.: **WO99/10211**

PCT Pub. Date: **Mar. 4, 1999**

(30) **Foreign Application Priority Data**

Aug. 21, 1997 (DE) 197 36 368

(51) **Int. Cl.⁷** **B60S 1/38; B60S 1/40**

(52) **U.S. Cl.** **15/250.201; 15/250.43**

(58) **Field of Search** **15/250.201, 250.43, 15/250.44, 250.361, 250.48, 250.451, 250.32**

(56) **References Cited**

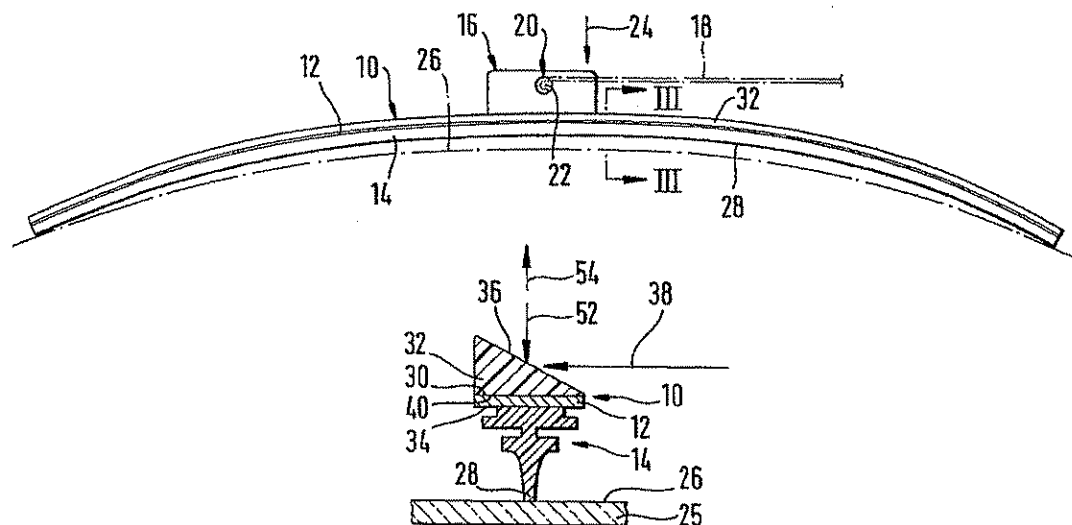
U.S. PATENT DOCUMENTS

3,088,155 * 5/1963 Smithers .
3,317,945 * 5/1967 Ludwig .

(57) **ABSTRACT**

A wiper blade (10) is proposed that serves to clean windows of motor vehicles. The wiper blade has an elongated, rubber-elastic wiper strip (14) which can be placed against the window to be wiped and is disposed substantially longitudinally axially parallel to one face, that is, the face oriented toward the window, of a striplike, spring-elastic support element (12), which is connected to a wiper arm (18) that is driven crosswise to the length of the wiper blade and can be urged toward the window. Even at high vehicle speeds, a requisite wiper blade contact pressure for attaining a swept field clean enough to meet legal requirements is achieved if the wiper blade (10) is provided with a leading-edge face (36 or 60), which extends longitudinally of the wiper blade and substantially parallel to the window and faces into the wind (arrow 38), and which crosswise to its length forms an acute angle with the window.

8 Claims, 1 Drawing Sheet



U.S. Patent

Sep. 25, 2001

US 6,292,974 B1

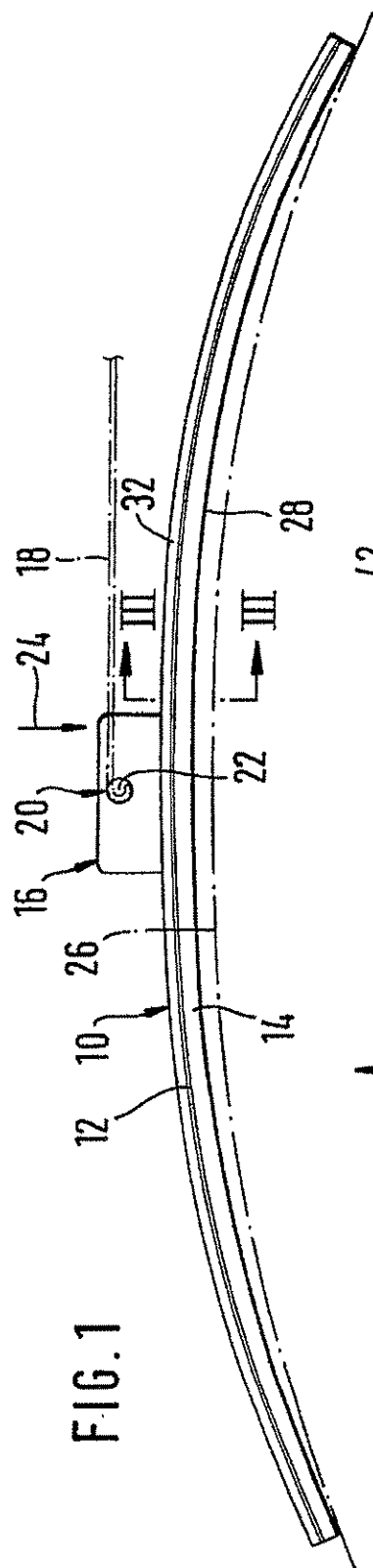


FIG. 1

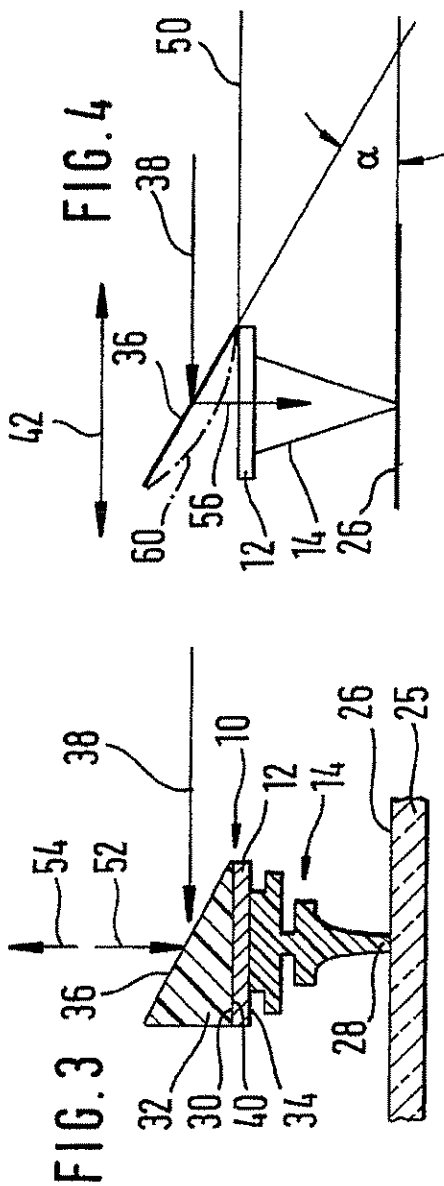


FIG. 3

FIG. 4

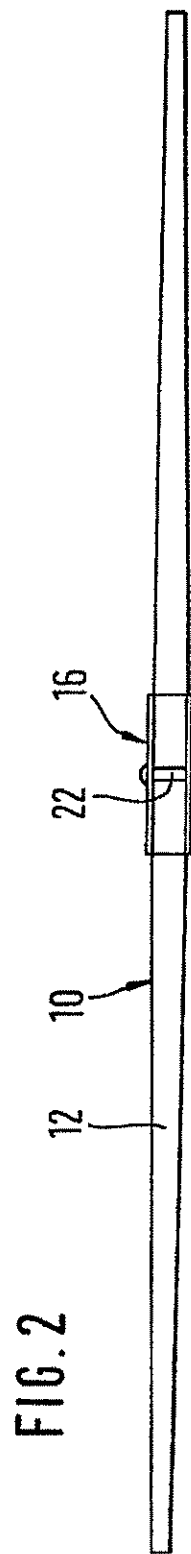


FIG. 2

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GLASS WIPER BLADE FOR MOTOR VEHICLES

BACKGROUND OF THE INVENTION

The present invention relates to a wiper blade for windows of motor vehicles.

In wiper blades the support element is meant to assure the evenest possible distribution of the wiper blade contact pressure on the windows, over the entire swept field swept by the wiper blade. By means of a suitable curvature of the unstressed support element—that is, when the wiper blade is not applied to the wiper blade—the ends of the wiper strip, which in wiper blade operation is pressed entirely against the window, are urged toward the window by the then-stressed support element, even if the radii of curvature of spherically curved vehicle windows differ in every position of the wiper blade. The curvature of the wiper blade must accordingly be somewhat greater than the greatest curvature measured in the swept field of the window to be wiped. The support element thus replaces the complicated support bracket construction, having two spring rails disposed in the wiper strip, of the kind employed in conventional wiper blades.

The invention takes as its point of departure a wiper blade of this type. In a known wiper blade of this type (German Patent DE-PS 12 47 161), the wiper blade, or its support element, which for reasons of distributing the contact pressure protrudes far past the wiper strip in the middle region of the wiper blade, can on the one hand be engaged from below, on the front side facing into the wind, with an attendant buildup of overpressure, by this overpressure. On the other hand, on the back side facing away from the wind, because of the structural form noted above, a considerable negative pressure builds up. Although the wiper blade, which during operation usually executes a pendulum motion, constantly changes its position relative to the oncoming relative wind, even then one of its long sides is always more or less greatly exposed to the wind and is therefore called the front side, while its other long side is accordingly also thought of as the back side. At relatively high vehicle speeds, given the cooperation of these two aforementioned pressures, both of which are oriented counter to the wiper blade contact pressure, this contact pressure is reduced at least enough that proper wiping is no longer possible. Increasing the wiper blade contact pressure against the window at high vehicle speeds could admittedly reduce the severity of this problem, but at lower vehicle speeds, when the liftoff tendency is less, the friction between the wiper blade and the window increases; this leads to undesirable noise buildup and to excessively high stress on the drive components and on the rubber of the wiper.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a wiper blade which avoids the disadvantages of the prior art.

In keeping with these objects, one feature of present invention, resides, briefly stated, in a wiper blade provided with a leading-edge face which extends longitudinally over the wiper blade and substantially parallel to the window and faces into the wind, and which crosswise to its length forms an acute angle with the window.

In the wiper blade of the invention, via the leading-edge face that faces into the wind, a force component aimed at the window is built up, which counteracts the liftoff tendency of the two pressures and thus assures excellent cleaning quality,

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at least in the region of the swept field swept by the wiper blade, that is, the region that is important to the vehicle's driver. Depending on the size of the leading-edge face and/or on the size of the approach angle α , this auxiliary contact pressure can be adapted to the variable demands that depend on the type of vehicle. It is also advantageous in the arrangement of the invention that as a function of the vehicle speed, the contact pressure rises or falls with this speed. Thus a suitably "high auxiliary contact pressure" is opposed only to the liftoff tendency that occurs at high speed.

A compact wiper strip is obtained if the leading-edge face is disposed on the face of the support element facing away from the window. The auxiliary contact pressure is then distributed not in point form but areally, over the entire length of the wiper blade.

The embodiment of a leading-edge face can advantageously be attained in that it is embodied on a separate, elongated component that is solidly joined to the support element.

A simple structure of such a separate component is obtained in that, seen in cross section, it has at least approximately the shape of a triangle, one side of which contacts the face of the support element facing away from the window, and also that the leading-edge face is embodied on another side of the triangle. In certain cases, it can be advantageous to equip the leading-edge face at least partially with a hollow curvature facing into the wind.

Securing the component to the one side of the support element is achieved economically by a glued connection. So that the distribution of the contact pressure effected by the support element will not be impaired, the component is made from a rubber-elastic material whose hardness is no greater, and is preferably less, than the hardness of the rubber-elastic wiper strip. Advantages in terms of production are attained if the component is made from a suitable plastic.

The length, and the width and height projected in the operating direction of the wiper blade, of the leading-edge face is designed to suit the requirements. In certain cases it is expedient if the leading-edge face extends at least nearly over the entire length of the wiper blade.

Further advantageous refinements and features of the invention are recited in the ensuing description of an exemplary embodiment shown in the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 shows a side view of a wiper blade of the invention;

FIG. 2 shows a plan view on the wiper blade of FIG. 1;

FIG. 3 shows a section through the wiper blade, taken along the line III—III in FIG. 1 and shown on a larger scale in schematic form; and

FIG. 4 shows a basic illustration of the wiper blade of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A wiper blade 10 shown in FIGS. 1 and 2 has a single- or multi-part, elongated, spring-elastic support element 12, to whose underside an elongated, rubber-elastic wiper strip 15 is secured longitudinally axially parallel to it. A connection device 16 is disposed on the top side of the support element, and with its aid the wiper blade 10 can be detachably

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connected to a driven wiper arm 18. A hook acting as a counterpart connection means is formed onto the free end 20 of the wiper arm 18 and grasps a pivot pin 22 that belongs to the connection device 22 of the wiper blade. The securing between the wiper arm 18 and the wiper blade 10 is taken on by securing means not shown in further detail but known per se and embodied as adapters. The wiper arm 18 and thus also the hook on the end 20 of the arm is urged in the direction of the arrow 24 toward the window to be wiped, whose surface to be wiped is suggested in FIG. 1 by a dot-dash line 26. Since the dot-dash line 26 is meant to represent the greatest curvature of the window surfaces, it is quite apparent that the curvature of the wiper blade 10, which rests with its two ends on the window, is greater than the maximum curvature of the window. Under the contact pressure (arrow 24), the wiper blade presses with its wiper lip 28 over its entire length against the window surface 26. This causes a tension to build up in the bandlike, spring-elastic support element 12, and this tension assures a proper contact of the wiper strip 14 or wiper lip 28, over their entire length, with the motor vehicle window.

The particular design of the wiper blade 10 will be described in further detail, especially in terms of FIGS. 3 and 4. On the upper face 30 of the bandlike support element 12, facing away from the windshield 25, a single- or multiple-part component 32 extending longitudinally of the wiper blade 10 is secured; it is made from a rubber-elastic material, preferably a plastic, whose hardness is less than the hardness of the rubber-elastic wiper strip 14. This wiper strip 14 is disposed on the lower face 34, toward the window 25, of the support element 12. As FIG. 1 shows, the component 32 extends over the entire length of the wiper blade 10. It has a cross section in the shape of a triangle or wedge (FIG. 3). In the exemplary embodiment, to that end, the shape of a non-isosceles triangle has been selected. The longest side 36 of this triangle forms a leading-edge face for the relative wind created by the motor vehicle, which is symbolized by the arrow 38 in FIG. 3. A second, shorter side 40 of the triangular shape faces toward the upper face 30 of the support element 12. The two faces, facing one another, of the support element 12 and 40 of the component 32 are joined together by gluing.

To explain the mode of operation of the wiper blade of the invention, see FIG. 4, in which all the necessary parts of the wiper blade are shown in basic form. During operation of the wiper blade, whose operating motion is represented by the double arrow 42 when the wiper blade is displaced with its wiper strip 14 over the surface 26 of the window, the support element 12 is located in a plane that extends substantially parallel to the surface 26 of the window. The wiper blade 10 then experiences a contact pressure 52 (FIG. 3) that is countered during wiper blade operation, especially at high vehicle speeds, by a liftoff tendency acting in the direction of the arrow 54 in FIG. 4. Since the leading-edge face 36 of the component 30 facing into the wind 38, and forms an acute angle α with the surface 26 of window 25, the pressure of the relative wind 38 generates a force component that is

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represented in FIG. 4 by the arrow 56. This force component 56 acts counter to the liftoff tendency (arrow 54) in FIG. 3 and thus keeps the contact pressure (arrow 52) within the legally prescribed range. In a departure from the exactly triangular cross-sectional shape shown in FIG. 3 for the component 12, this component can also be embodied such that its side facing into the wind 38 is provided with a hollow curvature 60, which is represented in FIG. 4 by a dot-dash line. But even with the provision of a hollow curvature on the side toward the wind 38, the component 30 maintains its basically triangular cross-sectional shape and thus also the possibility of the development of a force component (arrow 56 in FIG. 4) from the contact pressure with which the wind (arrow 38) meets the curved leading-edge face 60.

What is claimed is:

1. A wiper blade for windows of motor vehicles, comprising a curved, band-shaped, spring-elastic support element which distributes a pressure applied by a wiper arm and has a concave and a convex surface which defines corresponding planes; an elongated rubber-elastic wiper strip placeable on a window to be wiped and mounted to said concave surface of said support element which faces the window, substantially longitudinally parallel to said concave surface; a connection device provided for a wiper arm and arranged directly on a convex side of said support element; and a component which is separate from said wiper strip and is mounted directly to the convex surface of said support element so as to form a leading-edge face extending in a longitudinal direction of the support element and forming, as seen crosswise to its longitudinal extension, an acute angle with a plane which extends parallel to a plane formed by said convex surface.

2. A wiper blade as defined in claim 1, wherein said leading-edge face is disposed on a face of said support element which faces away from the window.

3. A wiper blade as defined in claim 1, wherein said leading-edge face is formed as a separate elongated component which is solidly joined to said support element.

4. A wiper device as defined in claim 3, wherein said component, seen in a transverse cross-section, has at least approximately a shape of a triangle with one side contacting a face of said support element facing away from the window, and said leading-edge face being formed on another side of said triangle.

5. A wiper device as defined in claim 3, wherein said component is glued to the one side of said support element.

6. A wiper device as defined in claim 3, wherein said component is composed of a rubber-elastic material with a hardness which is no greater than a hardness of said rubber-elastic wiper strip.

7. A wiper device as defined in claim 3, wherein said component is composed of plastic.

8. A wiper blade as defined in claim 1, wherein said leading-edge face extends at least nearly over an entire length of the wiper blade.

* * * * *

EXHIBIT B



US006675434B1

(12) **United States Patent**
Wilhelm et al.

(10) **Patent No.:** **US 6,675,434 B1**
(45) **Date of Patent:** **Jan. 13, 2004**

(54) **WIPER BLADE FOR THE GLASS SURFACES OF MOTOR VEHICLES WITH AN ELONGATED, SPRING-ELASTIC SUPPORT ELEMENT**

3,785,002 A 1/1974 Quinlan et al.
4,360,943 A 11/1982 Thompson
5,052,072 A 10/1991 Chen

(75) **Inventors:** Manfred Wilhelm, Eberdingen (DE);
Thomas Kotlarski, Buchlertal (DE);
Julius Mazurkiewicz, Diest (BE)

FOREIGN PATENT DOCUMENTS

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DE 198 02 451 A 7/1999
EP 0 646 507 A 4/1995

(73) **Assignee:** Robert Bosch GmbH, Stuttgart (DE)

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

Primary Examiner—Terrence R. Till

(74) *Attorney, Agent, or Firm*—Michael J. Striker

(21) **Appl. No.:** 09/763,070

(57) **ABSTRACT**

(22) **PCT Filed:** Jun. 30, 1999

(86) **PCT No.:** PCT/DE99/01880

§ 371 (c)(1),
(2), (4) **Date:** Feb. 16, 2001

(87) **PCT Pub. No.:** WO01/02224

PCT Pub. Date: Jan. 11, 2001

(51) **Int. Cl.⁷** A47L 1/02; B60S 1/02

(52) **U.S. Cl.** 15/250.454; 15/250.43

(58) **Field of Search** 15/250.43, 250.44,
15/250.451, 250.452, 250.453, 250.454

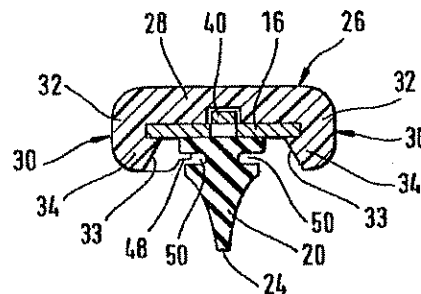
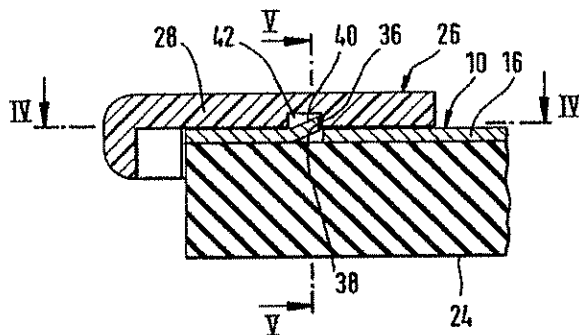
In a wiper blade (10) a termination part (26 or 126 or 232 or 326) which covers each end of the wiper blade (10) has a base body (28), located on the side remote from the window (18) and bracing itself on the wiper blade (16, 20) which base body is provided with hook-like extensions (30 or 330) that cross the support element (126) on both of its long sides and engage the side of the support element toward the window from behind; if at least one detent shoulder (36 or 132) pointing toward the other end portion is disposed on each of the two end portions of the support element, and a counterpart shoulder (38 or 134) present on the termination part is associated with the detent shoulders; and if furthermore at least one of the two shoulders and/or at least one of the two extensions is elastically deflectable.

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13 Claims, 4 Drawing Sheets

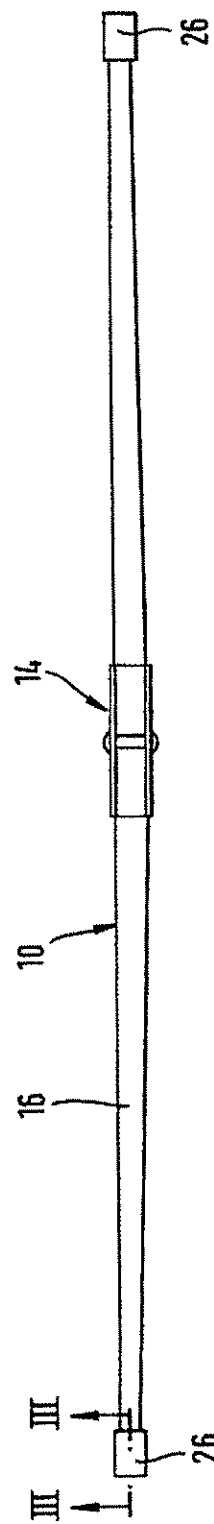
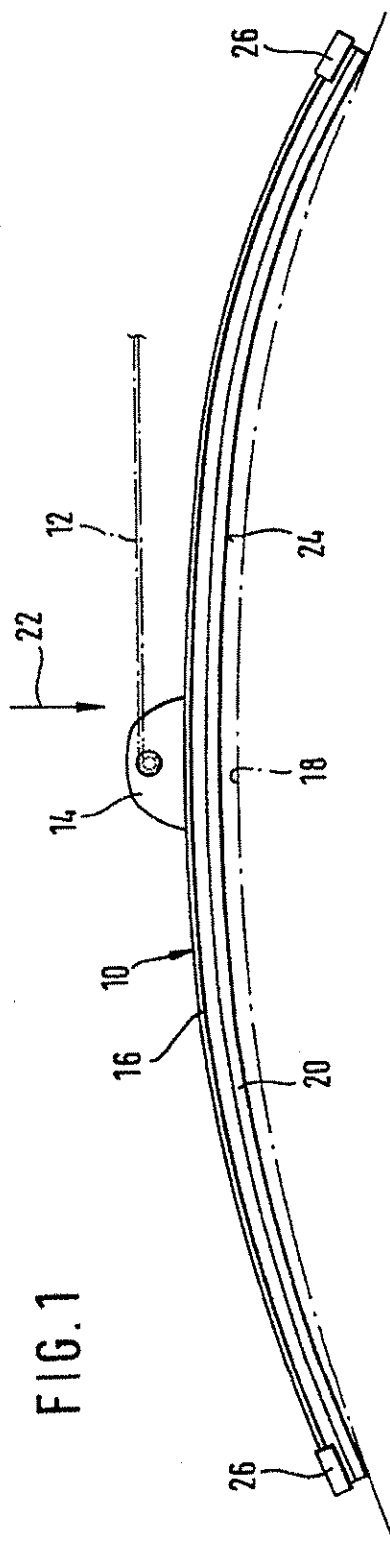


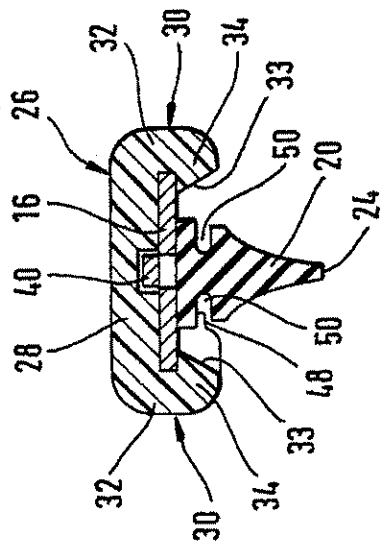
U.S. Patent

Jan. 13, 2004

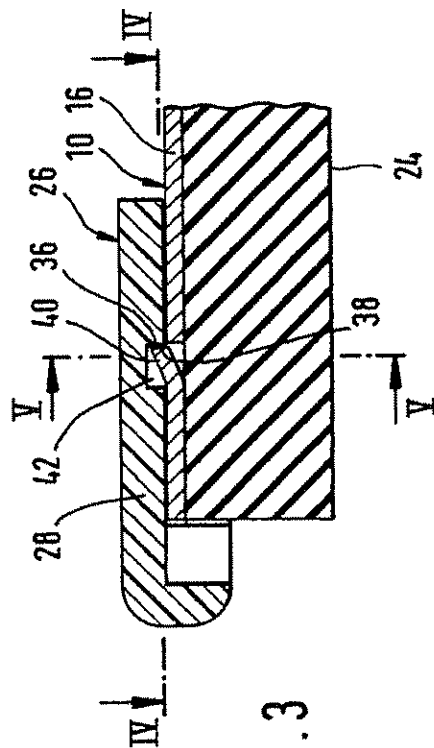
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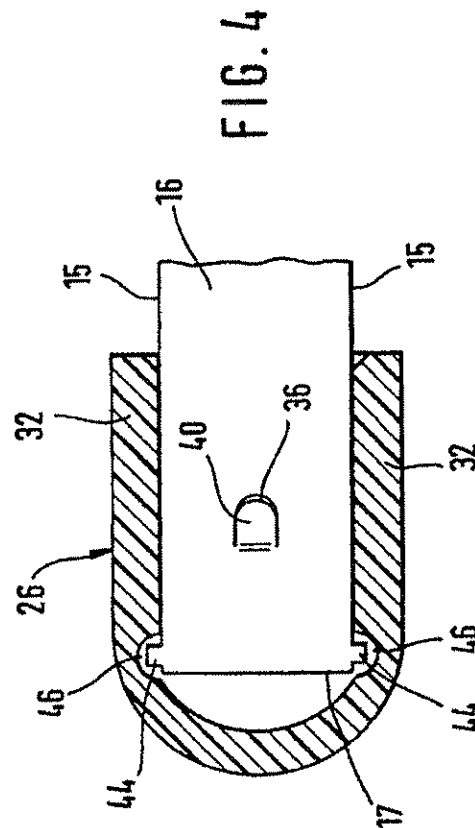




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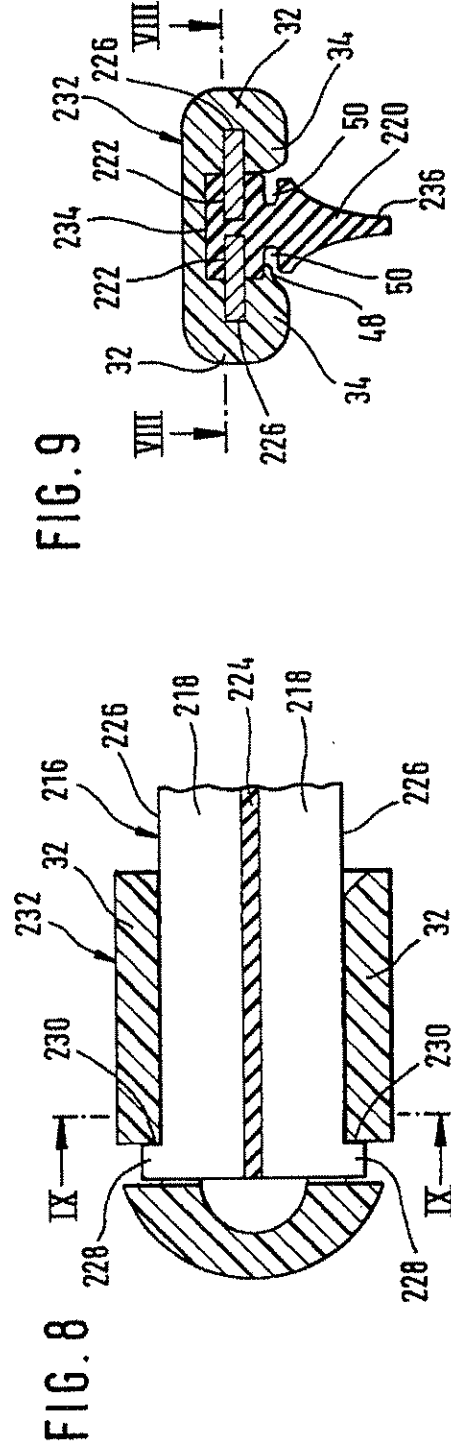
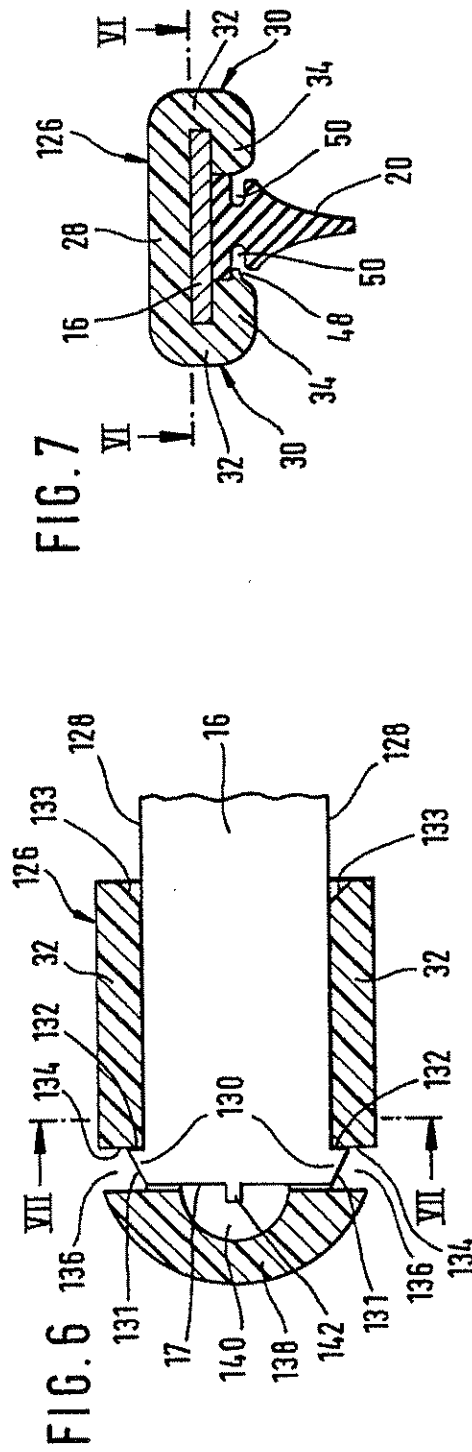
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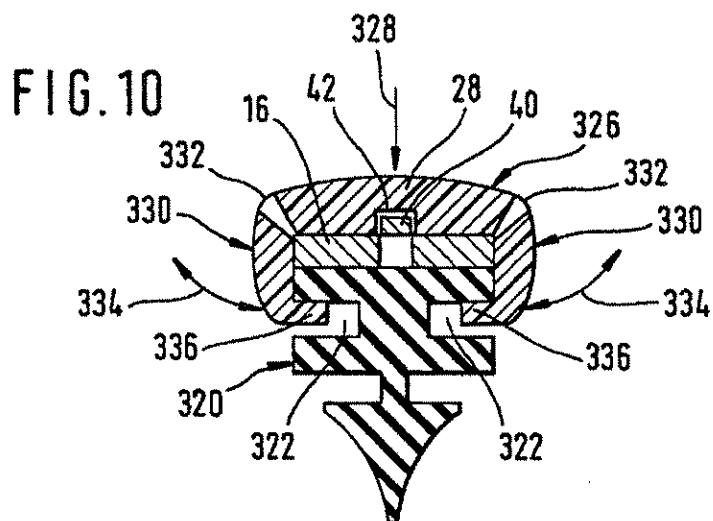


FIG. 11

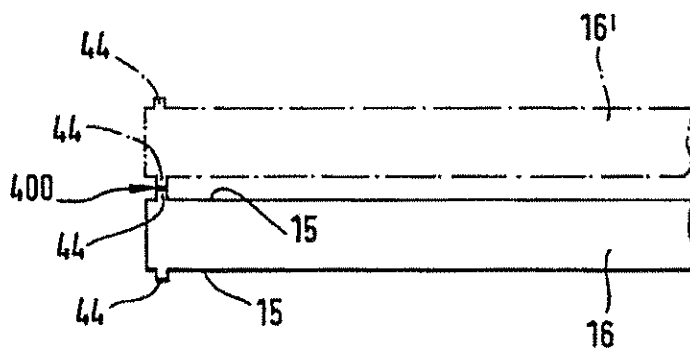
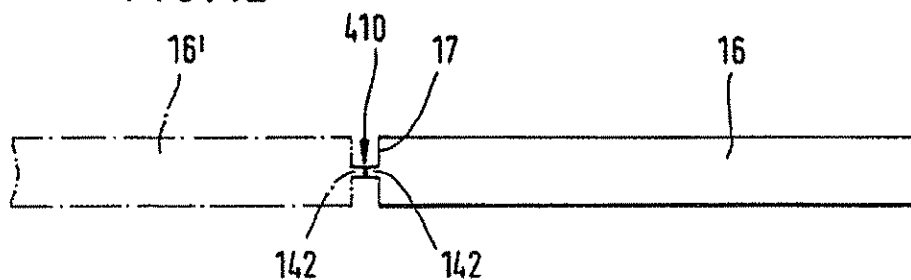


FIG. 12



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WIPER BLADE FOR THE GLASS SURFACES OF MOTOR VEHICLES WITH AN ELONGATED, SPRING-ELASTIC SUPPORT ELEMENT

BACKGROUND OF THE INVENTION

In wiper blades, the support element is meant, over the entire wiping field swept by the wiper blade, to assure that most uniform possible distribution of the wiper blade contact pressure against the window or glass, which pressure originates in the wiper arm. By element—that is, when the wiper blade is not resting against the window—the ends of the wiper strip, placed entirely against the window during operation of the wiper blade, are urged toward the window by the then-tensed support element, even if the radii of curvature of spherically curved vehicle windows change at each wiper blade position. The curvature of the wiper blade must accordingly be somewhat greater than the maximum curvature measured in the wiping field of the window to be wiped. The support element thus replaces the complicated support bracket construction with two spring rails disposed in the wiper strip of the kind used in conventional wiper blades (German Published, nonexamined Patent Application DE-OS 15 05 357).

The invention is based on a wiper blade as generically defined by the preamble to claim 1. In a known wiper blade of this type (U.S. Pat. No. 3,785,002), a shield-like termination part is disposed on each of its two end portions; with a comparatively long tongue, it rests on the top side, remote from the window, of the support element that is constructed of two leaf springs one above the other, and for securing the mounting position in the longitudinal direction, it has a cam that engages a recess of the upper leaf spring. Crosswise to the length of the wiper blade, the position securing is effected by means of a tunnel-like embodiment of the wiper strip on its two end regions that surround the support element together with the tongues of the two termination parts. The thus-fixed termination parts completely cover the ends of the wiper strip in the region of the sharp-edged support element. The design of the known wiper blade requires cost-intensive production processes both for the wiper strip and for the support element and the termination parts. Mounting the known wiper blade furthermore requires a plurality of mounting steps that can be done only by hand. Finally, the tongues of the termination parts stiffen the ends of the support element, which—especially in the case of spherically curved windows—has an unfavorable effect on the desired uniform distribution of contact pressure of the wiper strip against the window.

SUMMARY OF THE INVENTION

In the wiper blade according to the invention, the termination part can be embodied as short enough that no impairment of the elasticity of the support element occurs. The wiper strip can have a constant cross section over its entire length, and thus it can be produced economically by extrusion. Mounting the two termination parts is also done in a simple way by snapping them onto the support element or onto the already preassembled wiper blade, with the wiper strip retained on the support element. This snapping action can also be done by means of an automatic mounting station. The termination parts thus snapped on prevent injuries to persons handling the wiper blade from the ends of the support element, which as a rule have sharp edges.

If the support element is embodied as a one-piece spring band, on one band face of which, toward the window, the

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wiper strip is secured, and from the other band face of which, remote from the window, the detent shoulder protrudes, the support element can be produced economically and without waste from spring band steel.

In a detent shoulder embodied in this way, it is expedient if on the side of the termination part base body toward the support element, a throat is disposed, on which the counterpart shoulder of the termination part is embodied.

In certain advantageous production methods for the support element, it can happen that some protrusions remain on the long sides of the end regions of the support element, and these protrusions make it more difficult for the termination parts to snap cleanly onto the support element. These restrictions are avoided if cavities for receiving protrusions protruding from the long sides of the support element are disposed in the hook legs, crossing the support element, of the hook-like extensions of the termination part.

In certain versions of the wiper blade, it can be advantageous if the support element is embodied as a one-piece spring band, on one band face of which, toward the window, the wiper strip is secured, and the detent shoulder is embodied on at least one of the two long sides of the support element. It is possible in this respect to provide the detent shoulder on a peripherally open, partial recess disposed laterally on the support element.

An inexpensive embodiment of the counterpart shoulder is attained if the counterpart shoulder is embodied on the hook legs of the hook-like extensions of the termination part that cross the support element.

Especially whenever the width of the support element narrows toward its two ends, it is advantageous if the detent shoulder is embodied on a detent tooth that protrudes from the long side of the support element.

In another production process for the support element, which is expedient in certain cases, it can happen that some small protrusions remain on the face ends of the support element that prevent the termination parts from being snapped onto the support element. If such a method is employed, it has proved advantageous if a recess for receiving a protrusion protruding from the face end of the support element is disposed on the inside wall, covering the face end of the support element, of the termination part.

A further embodiment of the wiper blade of the invention is distinguished in that the hook-like extensions that cross the support element and engage the side of the support element toward the window from behind are each joined by a respective film hinge to the base body of the termination part. The result is an especially simple mounting of the termination parts on the support element, because they merely have to be placed in their operating position on the support element, or on the support element already equipped with the wiper strip; after that, the hook-like extensions need merely be hinged into their securing positions.

Additional security of the connection between the support element and the wiper strip is obtained if the wiper strip, on both of its long sides, has a respective longitudinal groove, the inside of which is engaged by the claw legs, oriented toward one another and disposed on the hook legs, of the termination part.

In a further embodiment of the wiper blade, which is expedient for certain applications, the support element has two elongated, spring-elastic retaining rails, which are each disposed one of the two longitudinal grooves extending along both long sides of the wiper strip, and the retaining rails protrude with their long edges remote from one another out of their longitudinal grooves of the wiper strip, and the detent shoulder is embodied on at least one of these two long edges.

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In a wiper blade constructed in this way, the counterpart shoulder of the termination part that is associated with the detent shoulder of the retaining rails are disposed on the hook-like extensions that cross the support element having the two retaining rails. Besides the simple mounting of the termination parts, the result, at no additional effort or expense, is that the two retaining rails are reliably secured in their mounting positions of the wiper strip.

The desired simplicity of fastening the termination parts to the support element or wiper blade can be achieved especially well, along with economical production, if the termination part is made from an elastic plastic.

Further advantageous refinements and features of the invention are disclosed in the ensuing description of exemplary embodiments shown in the associated drawing.

BRIEF DESCRIPTION OF THE DRAWING

Shown in the drawing are:

FIG. 1, the wiper blade of the invention in side view;

FIG. 2, a plan view on the wiper blade of FIG. 1;

FIG. 3, a longitudinal section through one end of the wiper blade, taken along the line III—III of FIG. 2, shown enlarged;

FIG. 4, a section through the arrangement of FIG. 3 taken along the line IV—IV;

FIG. 5, a cross section through the arrangement of FIG. 3 taken along the line V—V;

FIG. 6, a section as in FIG. 4 taken along the line VI—VI in FIG. 7, rotated by 90°, through a different embodiment of the invention;

FIG. 7, a section through the arrangement of FIG. 6 taken along the line VII—VII;

FIG. 8, a section as in FIG. 4 taken along the line VIII—VIII in FIG. 9, rotated by 90°, through a different embodiment of the invention;

FIG. 9, a section through the arrangement of FIG. 8 taken along the line IX—IX;

FIG. 10, a section in accordance with FIG. 5 through a further embodiment of the invention;

FIG. 11, a fragmentary sketch, reduced in size, of a support element belonging to the wiper blade, in order to explain one possible production method for the support element; and

FIG. 12, a fragmentary sketch as in FIG. 11, for a different production method for the support element.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A wiper blade 10 shown in FIGS. 1 and 2 belongs to a wiping apparatus for motor vehicle windows or other glass. The wiper blade 10 is secured to a driven wiper arm 12, represented by dot-dashed lines, that belongs to the wiper system. To that end, it has a connection device 14, with which it is pivotably connected to the free end of the wiper arm 12. The wiper blade 10 has an elongated, spring-elastic support element 16, on one band face of which, toward a window 18 of the motor vehicle, an elongated, rubber-elastic wiper strip 20 is held longitudinally parallel, for instance being glued on. The connection device 14 for the wiper arm 12 is seated on the other band face, remote from the windshield 18, of the support element 16. The wiper arm 12 and thus the wiper blade 10 as well are urged in the direction of the arrow 22 toward the motor vehicle windshield 18, represented by dot-dashed lines in FIG. 1, against which the

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wiper strip 20 that belongs to the wiper blade 10 can be pressed. In this operating position, the wiper blade is displaced by the wiper arm 12 crosswise to its length over the window 18 in order to clean the surface of the window. In FIG. 1, however, the wiper blade 10 is shown in a position in which only its two ends touch the window 18. To that end—as can be seen from FIG. 1—the unstressed wiper blade is curved more sharply than the window 18. Since the greatest curvature of the window surface is shown in FIG. 1, it is quite clear that the curvature of the wiper blade 10, resting with both ends on the window 18, is greater than the maximum window curvature. Under the contact pressure (arrow 22), the wiper blade presses with its wiper lip 24, over the full length thereof, against the window. In the process, a tension builds up in the spring-elastic support element 16 that assures for a proper contact of the wiper strip or wiper lip, over its entire length, with the window 18.

The special design of the wiper blade 10 will now be described in further detail. As FIGS. 1 and 2 show, one termination part 26 is disposed on each of the ends of the wiper blade 10, and these termination parts cover the face end edges 17 of the support element 16. Especially with support elements 16 made from a spring band steel, the termination parts 26 are intended to prevent the risk of injury from the sharp-edged face ends 17 of the support element 16 in the event that the final user of the wiper blade 10 handles it improperly, for instance when replacing wiper blades.

As FIGS. 3–5 for a first embodiment of the termination part 26 show, the termination part has a substantially plate-like base body 28, which is braced against the support element 16, on its side remote from the window, or on the wiper blade 10. FIG. 5 shows that hook-like extensions 30 are disposed on the base body 28; with legs 32, they cross the two long sides of the support element 16 and engage the support element from behind with claws 34 that adjoin the legs and point toward one another. Since in this exemplary embodiment the support element 16 is wider than the wiper strip 20, the extensions 30 surround only the side regions of the support element 16. To secure the termination parts 26 to the support element 16 in the longitudinal direction of the support element, a detent shoulder 36 pointing toward the other end portion is disposed on both portions of the support element; this detent shoulder is assigned a counterpart shoulder 38 provided in the base body 28 of the termination part 26. The detent shoulder 36 of the support element 16, embodied as a one-piece spring band, is embodied on the edge, pointing toward the other support element end, of a spring tab 40 cut free on three sides sheared out of the spring band and pressed through to the band face of the support element remote from the wiper strip 20; this spring tab is not shown in section in FIG. 4. In the mounting position of the termination part 16 (FIG. 3), this spring tab protrudes into a throat 42, oriented toward it, of the base body 28, and the wall of the throat 42 toward the detent shoulder 36 forms the counterpart shoulder 38 that cooperates with the detent shoulder 36. The mounting of the termination part 26 onto the support element 16 can be achieved by slipping the termination part onto the support element 16 in the longitudinal direction of the support element. Since the termination part is made from an elastic plastic, it can temporarily deflect elastically during assembly, until it reaches its final position. It is also possible for the spring tab 40 to be made elastically resilient, so that temporarily it can deflect until it snaps into the throat 42. In certain production methods for the support element 16, it can happen that there are no protrusions 44, whose origin will be explained hereinafter, remaining on the lateral end regions 15 of the support

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element 16. If proper mounting of the termination parts 26 is to be possible, cavities 46 for receiving the protrusions 44 are disposed in the legs 32 of the termination part 26 that cross the support element 16. In this case, the mounting is done from above, and the hook-like extensions 30 are deflected toward the side. To that end, the claws 34 have deflection chamfers 33, which in the clipping-on process cause a deflection of the extensions 30.

In a second embodiment of the invention, shown in FIGS. 6 and 7, the termination part 126 corresponds substantially to the termination part 26 described above. FIG. 7 shows that the termination part 126 likewise has a platelike base body 26, on which hook-like extensions 30 are disposed, whose hook legs 32 cross the plane of the support element 16 and, with claws 34, engage the side of the support element or wiper blade toward the window 18 from behind. For securing the mounting position in the longitudinal direction of the wiper blade, the requisite detent shoulder is embodied on the end portions of the two long sides 128 of the support element, on the support element 16 that once again is embodied as a one-piece spring band. This detent shoulder is located on teeth 130, protruding laterally from the long sides 128 of the support element, whose edges pointing toward the other end of the support element 16 form the detent shoulders 132. The counterpart shoulders 134 cooperating with the detent shoulders 132 are formed by the walls, toward the detent shoulders 132, of transverse channels 136, which free up the hook-like extensions 30 relative to the face end 138 of the termination part 126 to allow these extensions to be deflected more easily. As FIG. 6 also shows, a recess 140 is provided in the face end 138, for receiving a protrusion 142 at the face end edge 17 of the support element 16, which protrusion remains from a particular production method for the support element 16, and whose creation will be discussed hereinafter in further detail. It is naturally conceivable in the embodiment of the invention of FIGS. 3-6 as well to provide the crosswise channel 136 instead of the cavities 46. FIG. 6 shows that the two teeth 130 of the support element 16 are provided with approach chamfers 131 that extend at an incline toward the end edge 17 and that in cooperation with oblique connection halves 133 on the legs 32 of the extensions 30 assure easy mounting of the termination parts 126, since when the termination parts are slipped onto the support element 16 in its longitudinal direction, the extensions deflect elastically automatically, until the teeth 130 enter the crosswise channels 136.

In a further embodiment of the invention, shown in FIGS. 8 and 9, the support element 216 is formed by two elongated, spring-elastic retaining rails 218. Once the wiper blade has been mounted, these two retaining rails are each located in one of two longitudinal grooves 222 present on the two long sides of the wiper strip 220. A strut 224 that forms the bottom of the respective groove remains between the two longitudinal grooves 222 in the wiper strip.

The two retaining rails 218 protrude with their two long edges 226, remote from one another, from their longitudinal grooves 222 of the wiper strip 220. Attachments 228 protruding from the long edges 226 are disposed on each end of the two retaining rails 218, and the shoulders 230 of these extensions, pointing toward the other end of the support element 216, cooperate with counterpart shoulders assigned to them of the termination part 232 when the corresponding termination part is located in the mounting position shown in FIG. 8. Since the termination part used in this embodiment corresponds substantially to the termination part 126 of the embodiment described above, it can be explained by

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referring to the description of the termination part 126. In a departure from the termination part 126 of FIGS. 6 and 7, the termination part 232 of FIGS. 8 and 9 is provided with a groove-like longitudinal recess 234, for receiving part of the wiper strip 220, only in the region of its base body 28; because of how the retaining rails 218 are disposed in the longitudinal grooves 222 of the wiper strip, this longitudinal recess remains on the side remote from the wiper lip 236 of the wiper strip 220. The mounting of the termination part 232 can be done in the way explained for instance in conjunction with FIGS. 6 and 7 for the preceding exemplary embodiment. Mounting can be made still easier because the strut 224 that remains between the longitudinal grooves 222 can be deformed elastically, transversely to its length, in the course of mounting the termination parts 232. The counterpart shoulders of the termination part 232, which cooperate with the detent shoulders 230 of the extensions 228, are equivalent to the counterpart shoulders 134 of the previous embodiment.

A further embodiment of the invention, shown in FIG. 10, allows mounting of the termination part 326 in the direction of the arrow 328. In this embodiment, the support element is entirely equivalent to the support element 16 of FIGS. 3-5. In other words, it too has spring tabs 40 on its ends, and these tabs are cut out of it and pressed out of the wall face remote from the wiper strip 320. The detent shoulders 36 are embodied on these spring tabs 40 and cooperate with corresponding counterpart shoulders 38 that are disposed at the throat 42 in the base body 28 of the termination part 326. In the embodiment of FIG. 10, the wiper strip 320 is essentially as wide as the support element 16. On both of its opposed long sides, it has longitudinal grooves 322. In a departure from the embodiment of FIGS. 3-5, the hook-like extensions 330 are joined to the base body 28 of the termination part 326 by film hinges 332. The hook-like extensions 330 are also likewise freed up relative to the face end wall 138 (FIGS. 6 and 7) of the termination part, for instance by means of suitable crosswise channels 136, so that they are pivotable in the direction of the two double arrows 334. For mounting, the termination part 326 is placed in the direction of the arrow 328 onto the band face of the support element 16 remote from the window, so that the spring tab 40 of the support element 16 enters the cavity 46 of the termination part 326, whereupon the detent shoulder 36 and the counterpart shoulder 38 prevent longitudinal shifting of the termination part 326. The fastening of the termination part 326 to the wiper blade is attained and assured by means of a suitable pivoting 334 of the hook-like extensions 330, whose claws 336, becoming slightly deformed, dip into the wall facing them and are firmly held there. Although in this embodiment the hook-like extensions dip into the longitudinal grooves of the wiper strip 320, they still engage the side of the support element toward the window from behind.

It is accordingly a common feature of all the exemplary embodiments that the termination part 26 or 126 or 232 or 326 has a base body 28, braced on the wiper blade and located on the side of the support element remote from the window 18, and this base body is provided with hook-like extensions 30 or 330, crossing the support element on both of its long sides and engaging the side of the support element toward the window from behind; on each of the two end portions of the support element, there is at least one detent shoulder 36 or 132 or 230, pointing toward the other end portion, which is assigned a counterpart shoulder 38 or 134 on the termination part; and at least one of the two shoulders is elastically deflectable. The elasticity of the plastic to be

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used to produce the termination parts 26 or 126 or 232 or 326 should be selected such that on the one hand problem-free mounting is possible, but on the other a reliable seat of the termination parts in their mounting position is assured.

In the embodiments described in conjunction with FIGS. 3-5, 6 and 7 and 8 and 9, it can be advantageous if at least one of the claws 34, with a retaining tab 48, engages a longitudinal recess 50 present on the wiper strip 20 or 220, in order to secure the connection, which is subject to especially heavy stress, between the support element and the wiper strip on the ends of the wiper blade.

In one possible production method for the support element 16 (FIG. 11), this support element is cut out of a wide spring band strip, using a cutting tool. To simplify further machining of the support element 16, however, the support elements 16, 16' cut out one after the other (shown in dot-dashed lines) and subsequent ones are left hanging on one another by connecting struts 400, so that the support elements 16, 16' for instance are guided in good order through a bath for treating the support element surfaces and can then be delivered to further handling stations. Shortly before the mounting of the wiper blade, the individual support elements 16, 16' are then separated from one another by breaking the narrow connecting struts 400, as a result of which the protrusions 44 described in conjunction with FIG. 4 remain on each of the support elements.

In another possible production method for the support element 16, 16' (shown in dot-dashed lines in FIG. 12), a narrow spring steel strip is guided in the longitudinal direction through a cutting tool, which cuts the support elements 16, 16' to length as needed, while letting them cohere via a narrow connecting strut 410 for the reason mentioned above. In this case as well, simple further treatment of the support elements 16, 16' thus becomes possible; before the mounting of the wiper blade, they are then separated from one another in that the connecting struts 410 are broken. The small protrusions 142 described in conjunction with FIG. 6 then remain on each support element but do not impair the function of the support element.

What is claimed is:

1. A wiper blade (10) for windows or other glass of motor vehicles, having an elongated, spring-elastic support element (16), on whose side toward the window or glass an elongated, rubber-elastic wiper strip (20) that can be placed against the window or glass is located parallel to the longitudinal axis, and on the side of the support element remote from the window or glass, in the middle portion of the support element, a device for attaching a driven wiper arm is disposed, the two ends of the wiper blade (10) each being covered by a respective termination part (26) in the region of the support element (16), characterized in that the termination part (26) has a base body (28), located on the side of the support element (16) remote from the window (18) and bracing itself on the wiper blade (16, 20), which base body is provided with hook-like extensions (30 or 330) that cross the support element (16) on both of its long sides and engage the side of the support element (16) toward the window from behind; that at least one detent shoulder (36 or 132) pointing toward the other end portion is disposed on each of the two end portions of the support element, and a counterpart shoulder (38 or 134) present on the termination part (26 or 126) is associated with the detent shoulder; and that at least one of the two shoulders (36, 132, 38, 134) and/or at least one of the two extensions (30) is elastically deflectable.

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2. The wiper blade of claim 1, characterized in that the support element (16) is embodied as a one-piece spring band, on one band face of which, toward the window, the wiper strip (20) is secured, and from the other band face of which, remote from the window, the detent shoulder (36) protrudes.

3. The wiper blade of claim 2, characterized in that on the side of the termination part base body (28) toward the support element (16), a throat (42) is disposed, on which the counterpart shoulder (38) of the termination part (26) is embodied.

4. The wiper blade of claim 1, characterized in that cavities (46) for receiving protrusions (44) protruding from the long sides of the support element are disposed in the hook legs (32), crossing the support element (16), of the hook-like extensions (30) of the termination part (26).

5. The wiper blade of claim 1, characterized in that the support element (16) is embodied as a one-piece spring band, on one band face of which, toward the window (18), the wiper strip (20) is secured, and that the detent shoulder (132) is embodied on at least one of the two long sides of the support element.

6. The wiper blade of claim 5, characterized in that the counterpart shoulder (134) is embodied on the legs (32) of the hook-like extensions of the termination part (26) that cross the support element (16).

7. The wiper blade of claim 5, characterized in that the detent shoulder (132) is embodied on a detent tooth (130) that protrudes from the long side of the support element.

8. The wiper blade of claim 5, characterized in that a recess (140) for receiving a protrusion (142) protruding from the face end of the support element is disposed on the inside wall, covering the face end (17) of the support element (16), of the termination part (26).

9. The wiper blade of claim 1, characterized in that the hook-like extensions (330) that cross the support element and engage the side of the support element (16) toward the window from behind are each joined by a respective film hinge (332) to the base body (28) of the termination part (326).

10. The wiper blade of claim 9, characterized in that the wiper strip (320), on both of its long sides, has a respective longitudinal groove (322), the inside of which is engaged by the claw legs, oriented toward one another and disposed on the hook legs, of the termination part.

11. The wiper blade of claim 1, characterized in that the support element (216) has two elongated, spring-elastic retaining rails (218), which are each disposed in one longitudinal groove (222) extending along both long sides of the wiper strip; that the retaining rails (218) protrude with their long edges remote from one another out of their longitudinal grooves (222) of the wiper strip (220); and that the detent shoulder (230) is embodied on at least one of these two long edges.

12. The wiper blade of claim 11, characterized in that the counterpart shoulder of the termination part that are associated with the detent shoulder (230) of the retaining rails (218) are disposed on the hook-like extensions (32, 34) that cross the support element (216) having the two retaining rails.

13. The wiper blade of claim 1, characterized in that the termination part (26 or 126 or 232 or 326) is made from an elastic plastic.

* * * * *

EXHIBIT C



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(12) **United States Patent**
De Block et al.

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(45) **Date of Patent:** Sep. 20, 2005

(54) **WIPER BLADE FOR CLEANING SCREENS
IN PARTICULAR ON MOTOR VEHICLES**

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(52) U.S. Cl. **15/250.201; 15/250.43**

(58) Field of Search 15/250.201, 250.43,
15/250.44, 250.361, 250.48

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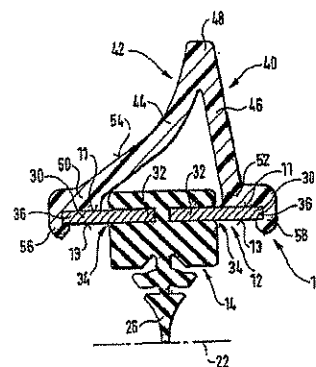
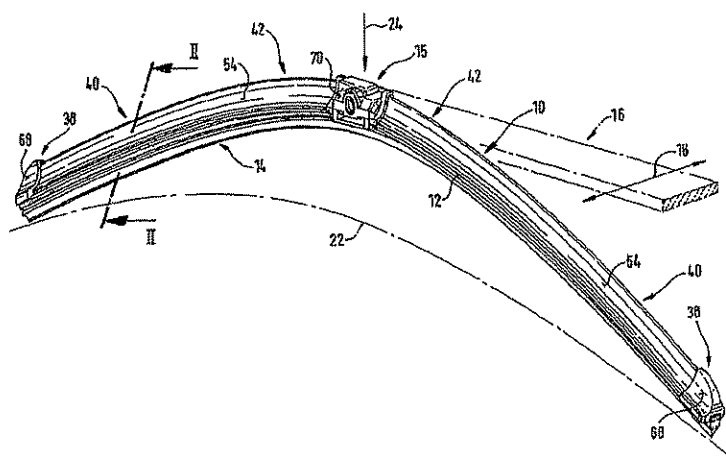
Primary Examiner—Gary K. Graham

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(57) **ABSTRACT**

A wiper blade for cleaning motor vehicles is proposed, which is provided with a band-like, elongated, spring-elastic support element (12). The lower band surface (13) of the support element (12) oriented toward the window (22) has an elongated, rubber-elastic wiper strip (14), which can be placed against the window (22), disposed on it so that the longitudinal axes of these two parts are parallel and the upper band surface (11) of the support element (12) has a wind deflection strip (42) disposed on it, which extends in the longitudinal direction of the support element, is provided with an attack surface (54) oriented toward the main flow of the relative wind, and is comprised of an elastic material. A considerable weight savings for the wiper blade is achieved if the wind deflection strip (42, 142, or 242) has two diverging legs (44, 46), viewed in cross section, which are connected to each other at a common base (48) and whose free ends (50, 52) oriented toward the window (22) are supported on the wiper blade (10), and the attack surface (54) is embodied on the outside of the one leg (44).

19 Claims, 4 Drawing Sheets

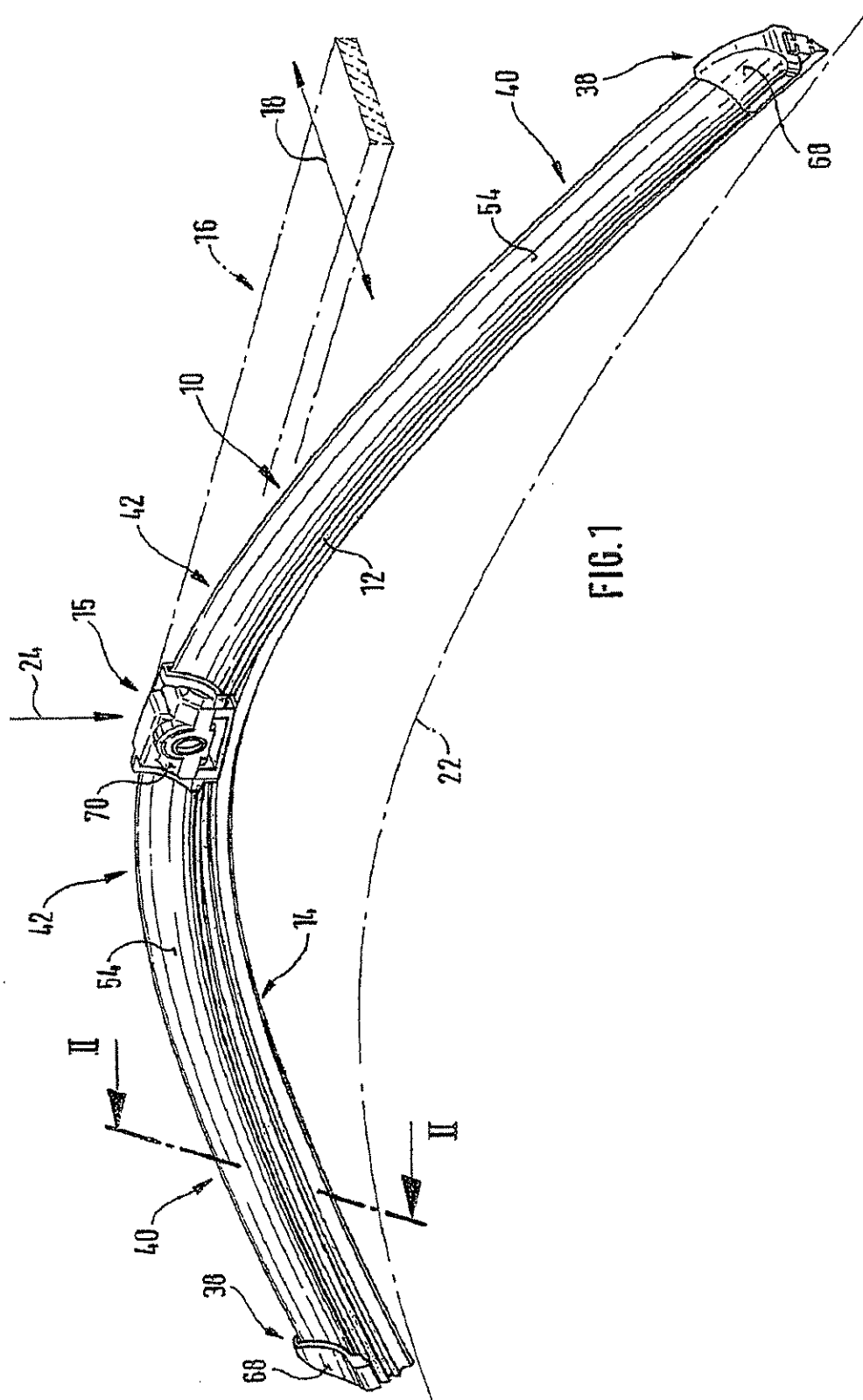


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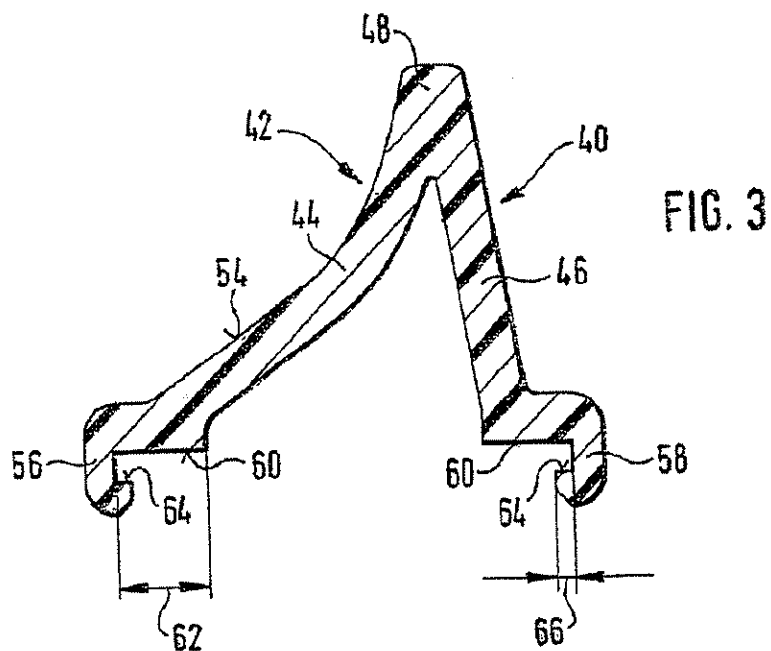
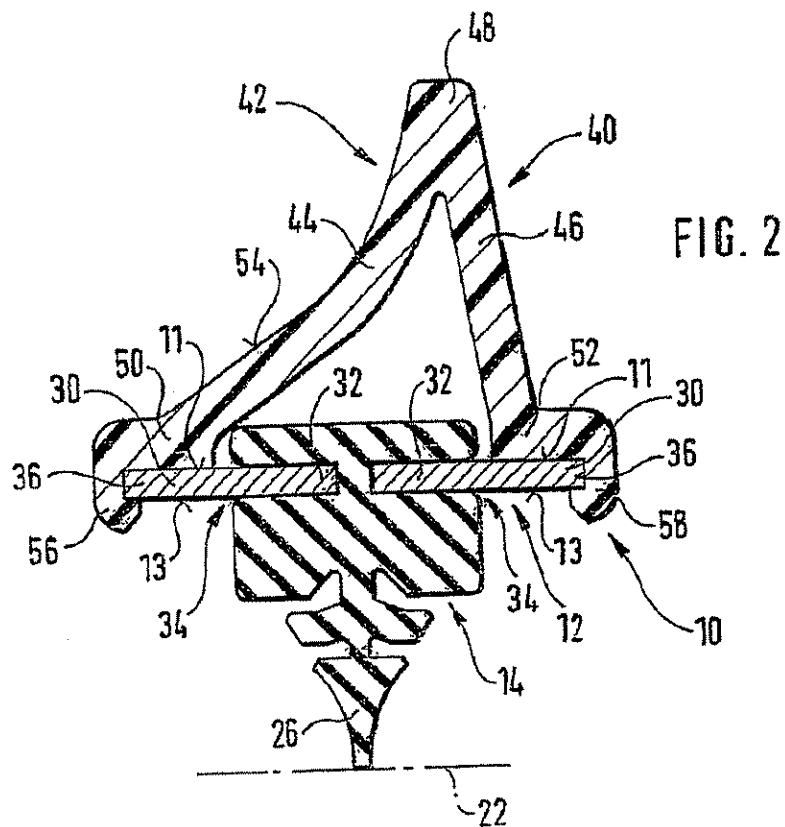


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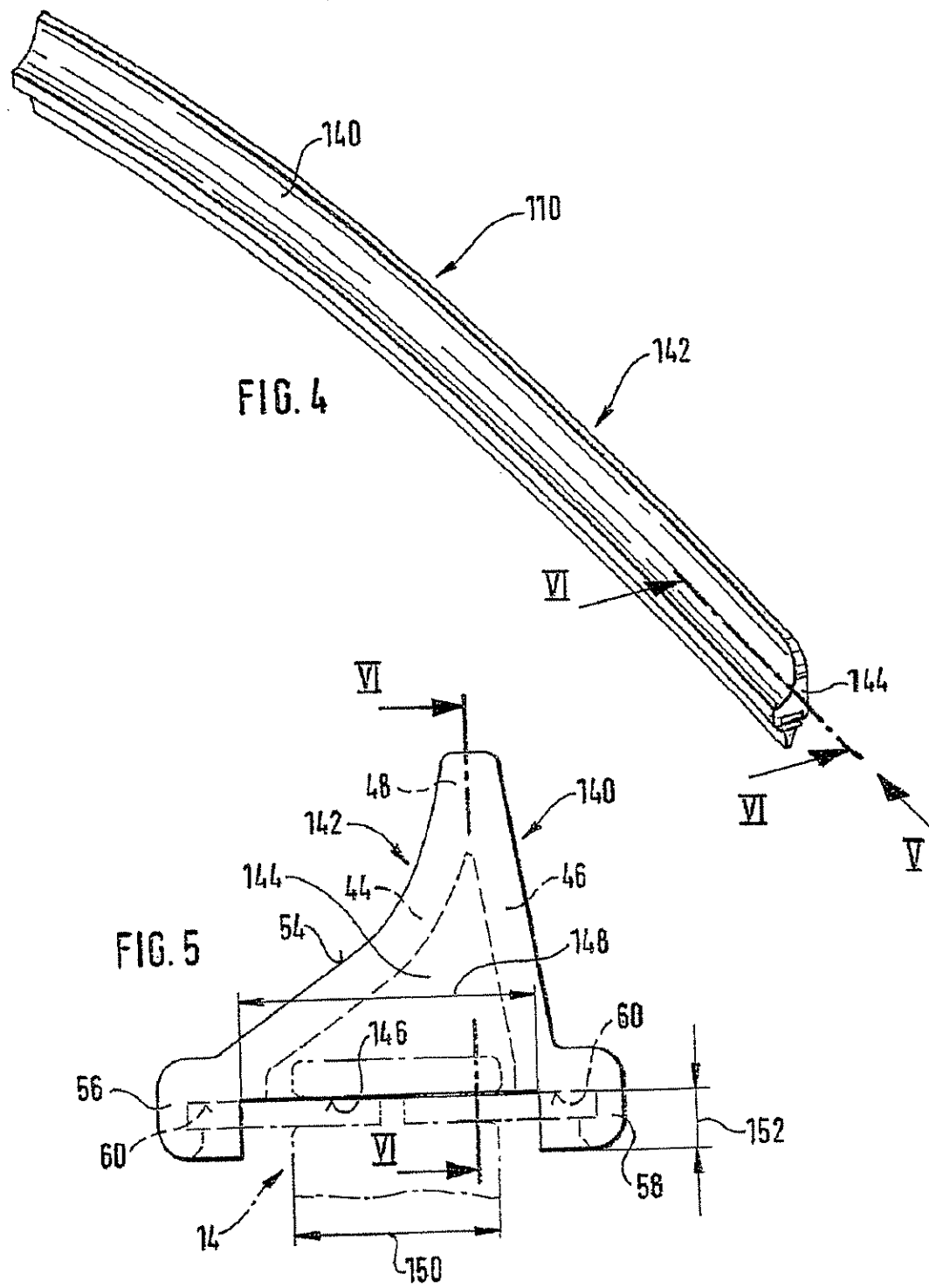


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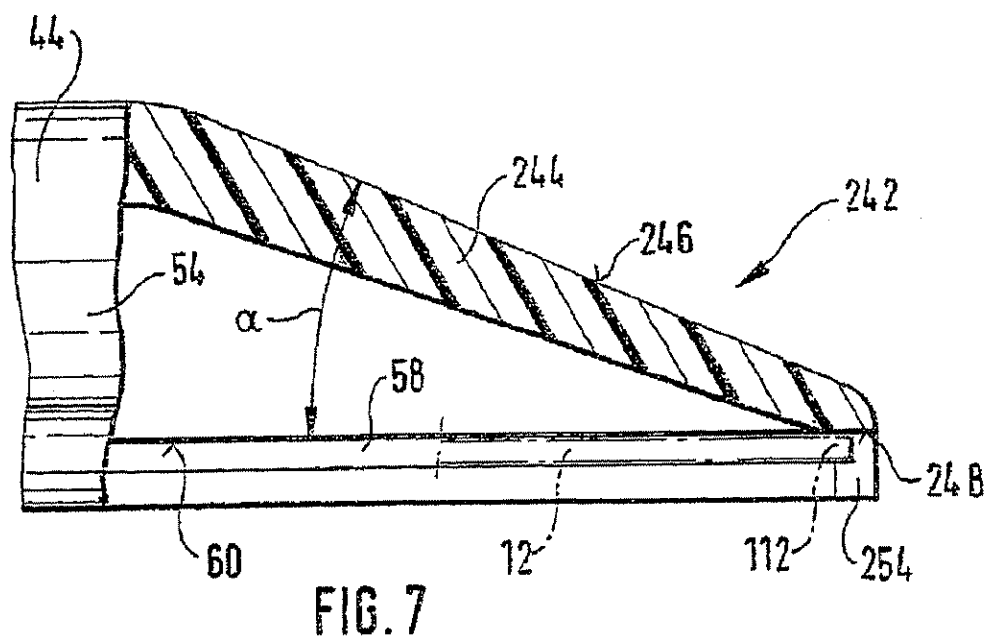
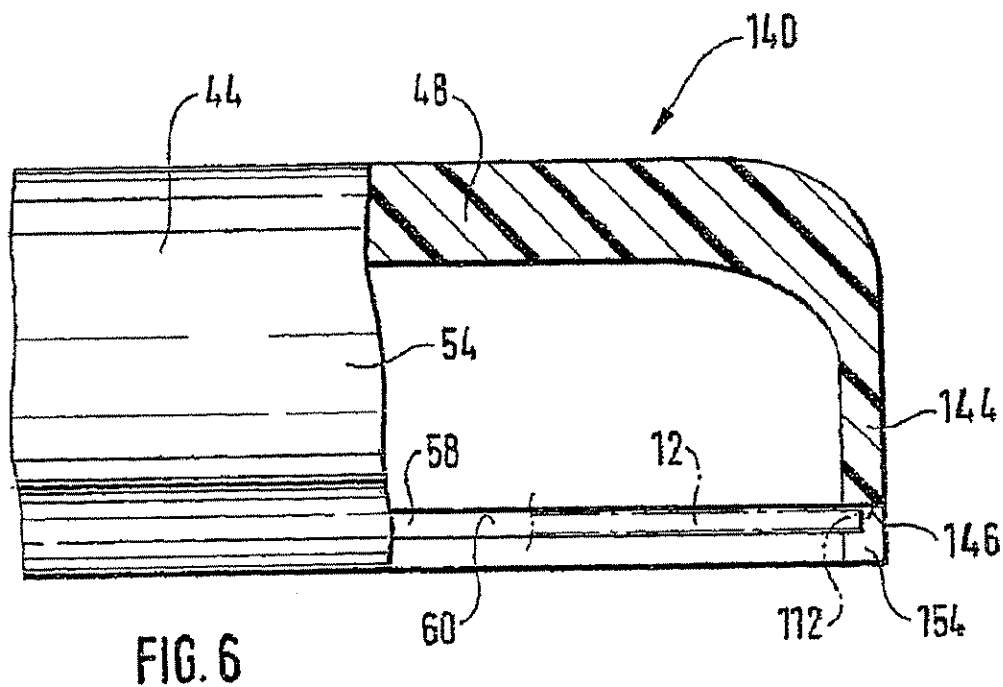


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WIPER BLADE FOR CLEANING SCREENS IN PARTICULAR ON MOTOR VEHICLES

BACKGROUND OF THE INVENTION

In known wiper blades, the purpose of the support element is to assure as uniform as possible a distribution of the wiper blade pressure against the window, which pressure is exerted by the wiper arm, over the entire wiping field wiped by the wiper blade. Through an appropriate curvature of the unloaded support element—i.e. when the wiper blade is not resting against the window—the ends of the wiper strip, which is placed completely against the window during operation of the wiper blade, are loaded toward the window by the support element, which is stretched in this state, even though the curvature radii of spherically curved vehicle windows change with each wiper blade position. The curvature of the wiper blade must therefore be somewhat sharper than the sharpest curvature measured within the wiping field on the window to be wiped. The support element consequently replaces the expensive support bracket structure with two spring strips disposed in the wiper strip, as is the practice in conventional wiper blades (DE-OS 15 05 357).

The invention is based on a wiper blade. In a known wiper blade of this kind (DE 197 36 368), the wiper blade is provided with a so-called wind-deflection strip so that the airflow-induced tendency of the wiper blade to lift up from the window that occurs at high driving speeds is counteracted by a force component directed toward the window. To this end, the wind-deflection strip has a front side, which is embodied as an attach surface and is acted on chiefly by the relative wind during the reciprocating wiper operation. The cross section of the wind-deflection strip is approximately the shape of a right triangle, whose one leg is oriented toward the support element and whose hypotenuse represents the attach surface. This attach surface encloses an acute angle with the plane of the reciprocating motion of the wiper blade and with the surface of the window. The triangular profile used requires a relatively large amount of material for the manufacture of the wind-deflection strip, which is reflected in the costs for the wiper blade. Moreover, the weight of the wiper blade is considerably increased in an undesirable fashion. Namely, the increased mass, which must be accelerated in the reciprocating wiper operation, requires a more powerful drive unit and a more expensive design of the reciprocating mechanism connected to this drive unit. In addition, the profile-induced rigidity of a wind-deflection strip that is shaped in this way can impair the operating behavior of the support element and/or the wiper blade.

SUMMARY OF THE INVENTION

In the wiper blade according to the invention, the weight of the wind-deflection strip is considerably reduced by the cross sectional embodiment of an angular profile. Moreover, in addition to the savings in material, there is also a reduction of the mass being moved, with the resulting advantages with regard to the design of the drive unit and the reciprocating mechanism. In addition, the rigidity of the wind deflection strip is considerably reduced and as a result, so is its influence on the bending and elastic behavior of the wiper blade support element.

If the wiper blade part of a device, which is for connecting the wiper blade to a reciprocally driven wiper arm, is supported on the upper band surface of the support element

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in its middle section and an end cap is placed at both ends of the support element, then a simple installation of the wind deflection strip is produced when the strip is comprised of two sections, each of which extends between a respective end cap and the device piece.

In a modification of the invention, the profile of the cross section is the same over the entire length of the wind deflection strip. As a result, it can be manufactured in a particularly inexpensive manner using the extrusion process.

In a modification of the invention, the two legs of the wind deflection strip are connected to each other by a wall in the vicinity of the two wiper blade ends. With the use of a wind deflection strip of this kind, which is to be manufactured in an injection mold, the end caps to be placed at the ends of the support element or the wiper blade can be eliminated because this wall constitutes the end of the wind deflection strip. Furthermore, a wind deflection strip manufactured in this way can be arbitrarily shaped. It can also easily adapt to arbitrary shapes of the support element, for example when the support element has a cross sectional reduction in the longitudinal direction from the middle region toward the ends.

It is also possible to embody the tapering of the cross section of the wind deflection strip toward its ends in accordance with stylistic considerations. Thus on the one hand, it can be useful if the wall is aligned essentially perpendicular to the support element.

On the other hand, an attractively formed end of the wind deflection strip can also be achieved through a correspondingly oblique alignment of the wall in which an outside of the wall encloses an acute angle α with the support element. It goes without saying that each of the two ends of two sections belonging to a wind deflection strip can be embodied differently in accordance with the measures outlined above.

In certain applications, in order to simplify installation of the wiper blade, it can be advantageous if the wall is provided with a recess, which is open at the edge toward the window and whose width is greater than the depth of wiper strip in the vicinity of the support element and whose depth reaches to the upper band surface of the support element.

An operationally reliable support of the wind deflection strip on the wiper blade is achieved through attachment of the leg ends to the wiper blade.

Such an attachment to the wiper blade can be easily and inexpensively achieved by means of a glued attachment.

If the free leg ends of the wind deflection strip are attached, preferably glued, to the support element of the wiper blade, this assures a precise positioning of the wind deflection strip on the wiper blade.

The positioning is further improved if in the embodiment of the concept of the invention, the free leg ends of the wind deflection strip are provided, at least in sections, with claw-like projections, which encompass the mutually opposed outer edge strips of the support element.

When using wind deflection strips, which are provided with the above-mentioned end walls, it is useful if the claw-like projections extend from the leg ends into the vicinity of the wall and suitably encompass end regions of the support element.

The claw-like projections, which are used as positioning aids, offer particularly advantageous regions for the glued attachment.

For a particularly stable, operationally reliable attachment of the wind deflection strip to the support element, the claw

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surface disposed on the upper band surface of the support element has a greater width than the claw surface engaging the lower band side.

The attack surface of the wind deflection strip is suitably embodied as a flute on the outer wall of the one leg.

In order to avoid an unfavorable flow progression of the relative wind sweeping past the wiper blade in the vicinity of the wiper blade ends, the end caps are provided with a flute, which extends in the projection of the flute of the wind deflection strip.

In order to counteract this disadvantage in the middle section of the wiper blade as well, the wiper blade part of the connecting device is provided with a flute, which extends in the projection of the flute of the wind deflection strip.

So that the distribution of the wiper blade pressure against the window by means of the individually designed support element is not significantly influenced by the wind deflection strip, the hardness of the material for the wind deflection strip is at most 40 percent greater than the hardness of the material for the wiper strip.

In this connection, it is particularly advantageous if the hardness of the material for the wind deflection strip is at most 20 percent greater than the hardness of the material for the wiper strip.

In many instances, it has turned out to be advantageous if the wiper strip has a Shore hardness A of between 64 and 71 and the wind deflection strip has a Shore hardness A of between 70 and 78.

Other advantageous modifications and embodiments of the invention are disclosed in the following description of exemplary embodiments shown in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective representation of a wiper blade according to the invention, with the wiper arm indicated with dot-and-dash lines,

FIG. 2 shows an enlarged cross section through the wiper blade along the line II—II in FIG. 1,

FIG. 3 shows the cross section according to FIG. 2 through the wind deflection strip associated with the wiper blade, without the wiper strip and the support element,

FIG. 4 is a partial depiction according to FIG. 1 of a differently embodied wiper blade according to the invention,

FIG. 5 shows an enlarged view of the wiper blade according to FIG. 4, viewed in the direction of the arrow V,

FIG. 6 shows an enlarged partial section along the line IV—IV through the end of the wind deflection strip associated with the wiper blade according to FIG. 4, whose position is clarified in FIG. 5 by a line VI—IV, and

FIG. 7 shows a section according to FIG. 6 through another embodiment of a wind deflection strip associated with the wiper blade according to the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A wiper blade 10 shown in FIG. 1 has a band-like, elongated, spring-elastic support element 12 (FIGS. 1 and 2), whose lower band side 13 oriented toward the window has an elongated, rubber-elastic wiper strip 14 attached to it so that the longitudinal axes of these two parts are parallel. On the upper band side 11 of the support element 12, which is oriented away from the window, which support element is also referred to as a spring strip, the middle section of the

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support element is provided with the wiper blade part 15 of a connecting device, with the aid of which the wiper blade 10 can be detachably connected in an articulating fashion to a wiper arm 16 indicated with dot-and-dash lines in FIG. 1. The wiper arm 16, which is driven to reciprocate in the direction of a double arrow 18 in FIG. 1, is loaded in the direction of an arrow 24 toward the window to be wiped, for example the windshield of a motor vehicle, whose surface is indicated with a dot-and-dash line 22 in FIG. 1. Since the line 22 is intended to represent the sharpest curvature of the window surface, it is clear that the curvature of the wiper blade, which is not yet under tension and rests with both of its ends against the window, is sharper than the maximal window curvature (FIG. 1). As a result of the pressure (arrow 24), the wiper blade 10 rests with its wiper lip 26 against the window surface 22 over its entire length. This causes a tension to be built up in the spring-elastic metal support element 12, which assures a uniform contact of the wiper strip 14 and the wiper lip 26 over its entire length against the window surface 22 and assures a uniform distribution of the pressure (arrow 24).

The particular embodiment of the wiper blade according to the invention will now be discussed in detail.

FIG. 2 shows that the support element 12 in the exemplary embodiment has two spring strips 30, which are disposed in a common plane approximately parallel to the window surface 22. The two spring strips 30 protrude with their mutually opposed inner edge strips 32 into longitudinal grooves 34 of the wiper strip 14, which are open at the edges, and protrude from these longitudinal grooves 34 with external edge strips 36. The two spring strips 30 are secured in their longitudinal grooves 34 by the part 15 of the connecting device in the middle region of the wiper blade and by end caps 38 disposed at each end of the wiper blade. To this end, these components 15 and 38 encompass the outer edge strips 36 of the spring strips 30. Sections 40 of a wind deflection strip 42 are respectively disposed between the part 15 and each of the two end caps 38. The disposition of the wind deflection strip 42 and its embodiment can be inferred from FIGS. 2 and 3. The wind deflection strip 42 comprised of an elastic material, for example a plastic, and its two sections 40 rest against the upper band side 11 of the support element 12. Viewed in cross section, the wind deflection strip 42 has two diverging legs 44 and 46, which are connected to each other by a common base 48. The free ends 50 and 52 of the legs 44 and 46 are oriented toward the window 22 and are supported against the wiper blade 10 or its support element 12. An attack surface 54, which is fluted in the exemplary embodiment, is embodied on the outside of the one leg 44 and the relative wind chiefly flows against this attack surface 54 during operation of the wiper device. The cross sectional form of the wind deflection strip 42 and/or of its sections 40 shown in FIGS. 2 and 4 is the same over the entire length so that these sections can be inexpensively extruded. At their free leg ends 50 and 52, the sections 40 of the wind deflection strip 42 are attached to the wiper blade and/or to its support element 12. Suitably, the free leg ends of the wind deflection strip 42 are glued to the support element 12 of the wiper blade 10. To that end, the free ends 50 and 52 of the legs 44 and 46 are provided with claw-like projections 56, 58, which suitably encompass the mutually opposed outer edge strips 36 of the support element 12. The surfaces of the claw-like projections 56, 58 resting against the edge strips 36 serve as gluing surfaces with which the sections 40 of the wind deflection strip 42 are glued to the support element. For a particularly stable glued attachment, the claw surfaces 60 resting against the upper band side 11 of the support element

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12 (FIG. 3) have a greater width 62 than the claw surfaces 64 engaging the lower band surface 13, whose width is labeled with the reference numeral 66 in FIG. 3. It can be inferred from FIG. 1 that the fluted attack surface 54 of the sections 40 also extends on the end caps 38 and on the part 15 of the connecting device. The fluting of the end caps 38 is labeled with the reference numeral 68 in FIG. 1, while the fluting of the component 15 is provided with the reference numeral 70. The wind deflection strip 42 or its sections 40 have a cross section that remains uniform over its entire length so that it can be inexpensively extruded.

FIGS. 4 to 6 show another embodiment of the wiper blade 110 according to the invention. Since the deviations from the wiper blade 10 relate solely to the wind deflection strip, FIG. 4 shows only a section of the wiper blade 110, which reaches from one end to the part 15 of the connecting device, which part is no longer depicted. The design of the wind deflection strip 142 associated with the wiper blade 110 corresponds to the exemplary embodiment described above insofar as its attachment to the support element 12 at the outer edge strips 36 of the support element spring strips 30 is concerned, so that the attendant details need not be discussed further. Therefore, the reference numerals that have been indicated in the embodiment described above will also be used below for the embodiments of the wind deflection strip 142 that have already been explained. Viewed in cross section, the wind deflection strip 142 likewise has two legs 44, 46, which are connected to each other at a common base 48. The free ends 50 and 52 of the legs 44 and 46 are likewise provided with claw-like projections 56 and 58, which suitably encompass the outer edge strips 36 of the spring strips 30. In this exemplary embodiment as well, the two sections 140 of the wind deflection strip 142, which are produced in an injection molding die, are glued to the support element 12 of the wiper blade 10. The claw-like projections permit the wind deflection strip to be simply clipped onto the support element and thus permit a precise positioning for the gluing process. Also, the glue points reliably overlap each other. In addition, a fluted attack surface 54 is likewise embodied on the leg 44 of the wind deflection strip 142 or on its sections 140 (FIG. 5).

Diverging from the exemplary embodiment according to FIGS. 1 to 3, the two legs 44 and 46 are connected to each other by means of a wall 144 at the wiper blade ends and at the ends of the sections 140 disposed there, which wall extends from the base 48 to the claw-like projections 56, 58. The wall 144 is aligned essentially perpendicular to the support element 12 and to the claw-like projections 56, 58 encompassing it.

As FIGS. 5 and 6 show, the wall 144 is provided with a recess 146, which is open at the edge oriented toward the window and whose width 148 is greater than the width 150 of the wiper strip 14 indicated with dot-and-dash lines in FIG. 5. The depth 152 of the recess 146 reaches to the upper band surface 11 of the support element 12. This can be conceptualized on the basis of the upper claw surface 60 in FIG. 5, which when the wind deflection strip is glued to the support element, rests against the upper band side 11 of the support element 12 or against the top of its spring strips 30. It can also be inferred from FIG. 6 that the claw-like projections extend from the ends of the legs 44, 46, into the vicinity of the wall 144 and suitably encompass the end regions 112 of the support element 12, which are indicated with dot-and-dash lines. In FIG. 6, the claw-like projection of the wall 144 of the section 140 has been labeled with the reference numeral 154. The claw-like projections 56, 58 in the exemplary embodiments according to FIGS. 1 to 3 and

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4 to 6 are also used to cover the sharp, free end edges of the support element 12 and are used as a reliable placement aid for the sections 40 and 140 when they are glued to the support element 12.

FIG. 7 shows an alternative disposition of the wall 144 (FIG. 6). The wall 244 situated in the end region of the wind deflection strip 242 is disposed so that its outside 246 encloses an acute angle α with the support element 12. This can be conceptualized on the basis of the claw-like projection 58, which encompasses the support element when the wind deflection strip 242 is connected to it and rests with its claw surface 60 against the upper band side 11 of the support element 12. Also in this embodiment, the wall 244 and/or its claw-like projection 254 is provided with a recess 248, which corresponds in its disposition and dimensions to the recess 146 according to the embodiment in FIGS. 4 to 6. FIG. 7 also shows that claw-like projections 254 are likewise disposed on the wall 244, which suitably encompass end regions 112 of the support element 12 that is indicated with dot-and-dash lines.

So that the desired properties of the wiper blade are not influenced to an impermissible degree by the design of the support element, the hardness of the material for the wind deflection strip 42 is at most 40% greater than the hardness of the material for the wiper strip 14. It is particularly advantageous to limit this value to 20%. In practice, it has turned out that the most favorable results with regard to the wiping quality over a broad vehicle speed range are achieved if the wiper strip 14 has a Shore hardness A of 68 and the wind deflection strip 42 has a Shore hardness A of 72.

In this connection, the thickness of the legs 44 and 46 is also of particular importance in the matching of the selected hardness of the materials for the wind deflection strip and the wiper strip.

All of the exemplary embodiments share the common trait that the wind deflection strip 42, 142, or 242 has two diverging legs 44 and 46, viewed in cross section, which are connected to each other at a common base 48 and whose free ends 50 and 52, which are oriented toward the window 22, are supported on the wiper blade 10, where the outflow surface 54 is embodied on the outside of the one leg 44.

By contrast to the exemplary embodiments described above, though, instead of the wind deflection strip 42 having two sections 40, it is also conceivable for it to be made up of one piece that extends over and covers the device part 15. Naturally, in this case, the wind deflection strip must have at least one appropriate recess, which permits the articulating connection between the wiper arm and the wiper blade.

It is also conceivable that due to particular criteria, it can be quite useful for the wiper blade according to FIG. 1 or FIG. 4 to be provided with only one section 40 or 140 of the wind deflection strip, which is fastened to the wiper blade either in its region close to the reciprocation axis or its region remote from this axis.

What is claimed is:

1. A wiper blade for cleaning windows, comprising:

a band-like, elongated, spring-elastic support element (12), wherein a lower band surface (13) of the support element oriented toward the window (22) has an elongated, rubber-elastic wiper strip (14), disposed on it so that the longitudinal axes of these two parts are parallel, wherein the wiper strip can be placed against a window, and wherein an upper band surface (11) of the support element (12; 30, 30) has a wind deflection strip (42) disposed on it, which extends in the longi-

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tudinal direction of the support element (12), is provided with an attack surface (54) oriented toward the main flow of the relative wind, and is made of an elastic material, wherein the wind deflection strip (42, 142, 242) has two diverging legs (44, 46), viewed in transverse cross section, wherein the two diverging legs are connected to each other at a common base (48) and wherein free ends of the two diverging legs oriented toward the window (22) are supported on the support element of the wiper blade (10), and the attack surface (54) is embodied on the outside of the one leg (44) above the support element, and the legs (44, 46) form therebetween an angular hollow space that expands from an upper narrowest point of the base downwardly to the upper band surface of the support element (12; 30, 30) and are in contact with the upper band surface (11) of the support element said legs contacting the upper band surface at a location laterally spaced from said rubber-elastic wiper strip.

2. The wiper blade according to claim 1, wherein the profile of the cross section is the same over the entire length of the wind deflection strip (42).

3. The wiper blade according to claim 1, wherein the two legs (44, 48) of the wind deflection strip (142 or 242) are connected to each other by means of a wall (144 or 244) in the vicinity of the two wiper blade ends.

4. The wiper blade according to claim 3, wherein the wall (144) is aligned essentially perpendicular to the support element (12).

5. The wiper blade according to claim 3, wherein the outside (246) of the wall (244) encloses an acute angle (a) with the support element (12).

6. The wiper blade according to claim 1, wherein the free leg ends (50, 52) of the wind deflection strip (42, 142, or 242) are glued to the support element.

7. The wiper blade according to claim 1, wherein the free leg ends (50, 52) of the wind deflection strip (42, 142, or 242) are attached, preferably glued, to the support element (12) of the wiper blade (10).

8. The wiper blade according to claim 1, wherein the free leg ends (50, 52) of the wind deflection strip (42, 142, or 242), at least in sections, are provided with claw-like projections (56, 58), which suitably encompass the mutually opposed outer edge strips (36) of the support element (12).

9. The wiper blade according to claim 8, wherein a glued attachment is produced in the vicinity of the claw-like projections (56, 58).

10. The wiper blade according to claim 1, wherein the attack surface (54) of the wind deflection strip (42, 142, or 242) is embodied as a flute on the outer wall of the one leg (44).

11. The wiper blade according to claim 1, wherein a hardness of the material for the wind deflection strip (42) is at most 40 percent greater than the hardness of the material for the wiper strip (14).

12. The wiper blade according to claim 1, wherein a hardness of the material for the wind deflection strip (42, 142, or 242) is at most 20 percent greater than the hardness of the material for the wiper strip (14).

13. A wiper blade for cleaning windows, comprising:

a band-like, elongated, spring-elastic support element (12), wherein a lower band surface (13) oriented toward the window (22) has an elongated, rubber-elastic wiper strip (14), which can be placed against the window, disposed on it so that the longitudinal axes of these two parts are parallel and wherein an upper band surface (11) of the support element has a wind deflection strip

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(42) disposed on it, wherein the wind deflection strip extends in a longitudinal direction of the support element (12), is provided with an attack surface (54) oriented toward the main flow of the relative wind, and is made of an elastic material, wherein the wind deflection strip (42, 142, 242) has two diverging legs (44, 46), viewed in transverse cross section, wherein the two diverging legs are connected to each other at a common base (48) and wherein free ends of the two diverging legs oriented toward the window (22) are supported on the support element, and the attack surface (54) is embodied on the outside of the one leg (44), wherein the upper band surface (11) of the support element (12), in its middle section, includes a wiper blade part (15) for connecting the wiper blade (10) to a reciprocally driven wiper arm (16) and is supported, wherein an end cap (38) is respectively disposed at both ends of the support element (12), and wherein a section (40) of the wind deflection strip (42) is disposed between and in contact with each respective end cap (38) and the device piece (15).

14. A wiper blade for cleaning windows, comprising:

a band-like, elongated, spring-elastic support element (12), whose lower band surface (13) oriented toward the window (22) has an elongated, rubber-elastic wiper strip (14), which can be placed against the window, disposed on it so that the longitudinal axes of these two parts are parallel and whose upper band surface (11) has a wind deflection strip (42) disposed on it, which extends in the longitudinal direction of the support element (12), is provided with an attack surface (54) oriented toward the main flow of the relative wind, and is made of an elastic material, wherein the wind deflection strip (42, 142, 242) has two diverging legs (44, 46), viewed in transverse cross section, which are connected to each other at a common base (48) and whose free ends oriented toward the window (22) are supported on the support element, and the attack surface (54) is embodied on the outside of the one leg (44), wherein the two legs (44, 46) of the wind deflection strip (142 or 242) are connected to each other by means of a wall (144 or 244) in the vicinity of the two wiper blade ends, and wherein the wall (144 or 244) is provided with a recess (146 or 246) that is open at the edge oriented toward the window (22), wherein the width (148) of this recess is greater than the width (150) of the wiper strip (14) in a vicinity of the support element and its depth (152) reaches to the upper band surface (11) of the support element (12).

15. A wiper blade for cleaning windows, comprising

a band-like, elongated, spring-elastic support element (12), whose lower band surface (13) oriented toward the window (22) has an elongated, rubber-elastic wiper strip (14), which can be placed against the window, disposed on it so that the longitudinal axes of these two parts are parallel and whose upper band surface (11) has a wind deflection strip (42) disposed on it, which extends in the longitudinal direction of the support element (12), is provided with an attack surface (54) oriented toward the main flow of the relative wind, and is made of an elastic material, wherein the wind deflection strip (42, 142, 242) has two diverging legs (44, 46), viewed in transverse cross section, which are connected to each other at a common base (48) and whose free ends oriented toward the window (22) are supported on the wiper blade (10), and the attack surface (54) is embodied on the outside of the one leg (44), wherein

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the free leg ends (50, 52) of the wind deflection strip (42, 142, or 242), at least in sections, are provided with claw-like projections (56, 58), which suitably encompass the mutually opposed outer edge strips (36) of the support element (12), and wherein the claw-like projections extend from the leg ends (50, 52) into a vicinity of a wall (154 or 254), and suitably encompass end regions (112) of the support element (12).

16. A wiper blade for cleaning windows, comprising:

a band-like, elongated, spring-elastic support element (12), whose lower band surface (13) oriented toward the window (22) has an elongated, rubber-elastic wiper strip (14), which can be placed against the window, disposed on it so that the longitudinal axes of these two parts are parallel and whose upper band surface (11) has a wind deflection strip (42) disposed on it, which extends in the longitudinal direction of the support element (12), is provided with an attack surface (54) oriented toward the main flow of the relative wind, and is made of an elastic material, wherein the wind deflection strip (42, 142, 242) has two diverging legs (44, 46), viewed in transverse cross section, which are connected to each other at a common base (48) and whose free ends oriented toward the window (22) are supported on the support element, and the attack surface (54) is embodied on the outside of the one leg (44), wherein the free leg ends (50, 52) of the wind deflection strip (42, 142, or 242), at least in sections, are provided with claw-like projections (56, 58), which suitably encompass the mutually opposed outer edge strips (36) of the support element (12), and wherein the claw surfaces (60) resting against the upper band surface (11) of the support element (12) have a greater width (62) than the claw surfaces (64) engaging the lower band side (13).

17. A wiper blade for cleaning windows, comprising:

a band-like, elongated, spring-elastic support element (12), whose lower band surface (13) oriented toward the window (22) has an elongated, rubber-elastic wiper strip (14), which can be placed against the window, disposed on it so that the longitudinal axes of these two parts are parallel and whose upper band surface (11) has a wind deflection strip (42) disposed on it, which extends in the longitudinal direction of the support element (12), is provided with an attack surface (54) oriented toward the main flow of the relative wind, and is made of an elastic material, wherein the wind deflection strip (42, 142, 242) has two diverging legs (44, 46), viewed in transverse cross section, which are connected to each other at a common base (48) and whose free ends oriented toward the window (22) are supported on the support element, and the attack surface (54) is embodied on the outside of the one leg (44), wherein the upper band surface (11) of the support element (12), in its middle section, the wiper blade part (15) of a device, which is for connecting the wiper blade (10) to a reciprocally driven wiper arm (16), is supported, wherein an end cap (38) is respectively disposed at both ends of the support element (12), wherein a section (40) of the wind deflection strip (42) is disposed between

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each respective end cap (38) and the device piece (15), and wherein the end caps (38) are provided with a flute (68), which extends in a projection of the flute of the attack surface (54) of the wind deflection strip.

18. A wiper blade for cleaning windows, comprising:

a band-like, elongated, spring-elastic support element (12), whose lower band surface (13) oriented toward the window (22) has an elongated, rubber-elastic wiper strip (14), which can be placed against the window, disposed on it so that the longitudinal axes of these two parts are parallel and whose upper band surface (11) has a wind deflection strip (42) disposed on it, which extends in the longitudinal direction of the support element (12), is provided with an attack surface (54) oriented toward the main flow of the relative wind, and is made of an elastic material, wherein the wind deflection strip (42, 142, 242) has two diverging legs (44, 46), viewed in transverse cross section, which are connected to each other at a common base (48) and whose free ends oriented toward the window (22) are supported on the support element, and the attack surface (54) is embodied on the outside of the one leg (44), wherein the upper band surface (11) of the support element (12), in its middle section, the wiper blade part (15) of a device, which is for connecting the wiper blade (10) to a reciprocally driven wiper arm (16), is supported, wherein an end cap (38) is respectively disposed at both ends of the support element (12), and wherein a section (40) of the wind deflection strip (42) is disposed between each respective end cap (38) and the device piece (15), and the wiper blade part (15) of the connecting device is provided with a flute (70), which extends in a projection of the flute of the attack surface (54) of the wind deflection strip (42).

19. A wiper blade for cleaning windows, comprising:

a band-like, elongated, spring-elastic support element (12), whose lower band surface (13) oriented toward the window (22) has an elongated, rubber-elastic wiper strip (14), which can be placed against the window, disposed on it so that the longitudinal axes of these two parts are parallel and whose upper band surface (11) has a wind deflection strip (42) disposed on it, which extends in the longitudinal direction of the support element (12), is provided with an attack surface (54) oriented toward the main flow of the relative wind, and is made of an elastic material, wherein the wind deflection strip (42, 142, 242) has two diverging legs (44, 46), viewed in transverse cross section, which are connected to each other at a common base (48) and whose free ends oriented toward the window (22) are supported on the support element, and the attack surface (54) is embodied on the outside of the one leg (44), and wherein the wiper strip (14) has a Shore hardness A of between 64 and 71, in particular 68, and the wind deflection strip (42) has a Shore hardness A greater than the wiper strip and is of between 70 and 78, in particular 72.

* * * * *

EXHIBIT D



US006978512B2

(12) **United States Patent**
Dietrich et al.

(10) **Patent No.:** US 6,978,512 B2
(45) **Date of Patent:** *Dec. 27, 2005

(54) **WIPER BLADE FOR CLEANING VEHICLE WINDOWS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 173 days.

This patent is subject to a terminal disclaimer.

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(58) Field of Search 15/250.43, 250.44,
15/250.451, 250.48, 250.452, 250.453, 250.454

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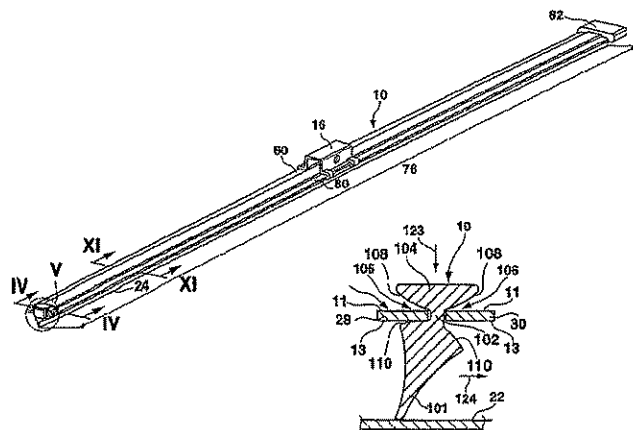
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(57) **ABSTRACT**

A wiper blade is proposed, which is for cleaning for windows, particularly of motor vehicles. The wiper blade (10) has an elongated, rubber-elastic wiper strip (14), which can be placed against the window (22) and is connected to an elongated, spring-elastic support element (12) so that their longitudinal axes are parallel, which support element (12) is directly connected to a device (16) for connecting the wiper blade to a driven wiper arm (18). The support element (12) has two band-like spring strips (28, 30), which are situated in a plane that is disposed in front of the window, essentially parallel to the window, and whose one, lower band surfaces (13) are oriented toward the window and whose adjacent, inner longitudinal edges (48), which are disposed spaced a distance (34) apart from each other, each protrude into a respective longitudinal groove (54, 56, or 106), which grooves are associated with each longitudinal edge and are open toward a respective longitudinal side of the wiper strip (14), and these two spring strips (36, 38) are connected to each other by at least two crosspieces (36, 38) disposed spaced apart from each other in the longitudinal direction. Manufacturing advantages for the wiper blade according to the invention are achieved if each crosspiece (36, 38) has a middle section (42) which extends spaced a distance (44) apart from the upper band surfaces (11) of the spring strips (28, 30), producing bridge-like crosspieces, where the distance (34) between the two longitudinal strips (28, 30) is less than the bridge width (46).

15 Claims, 4 Drawing Sheets



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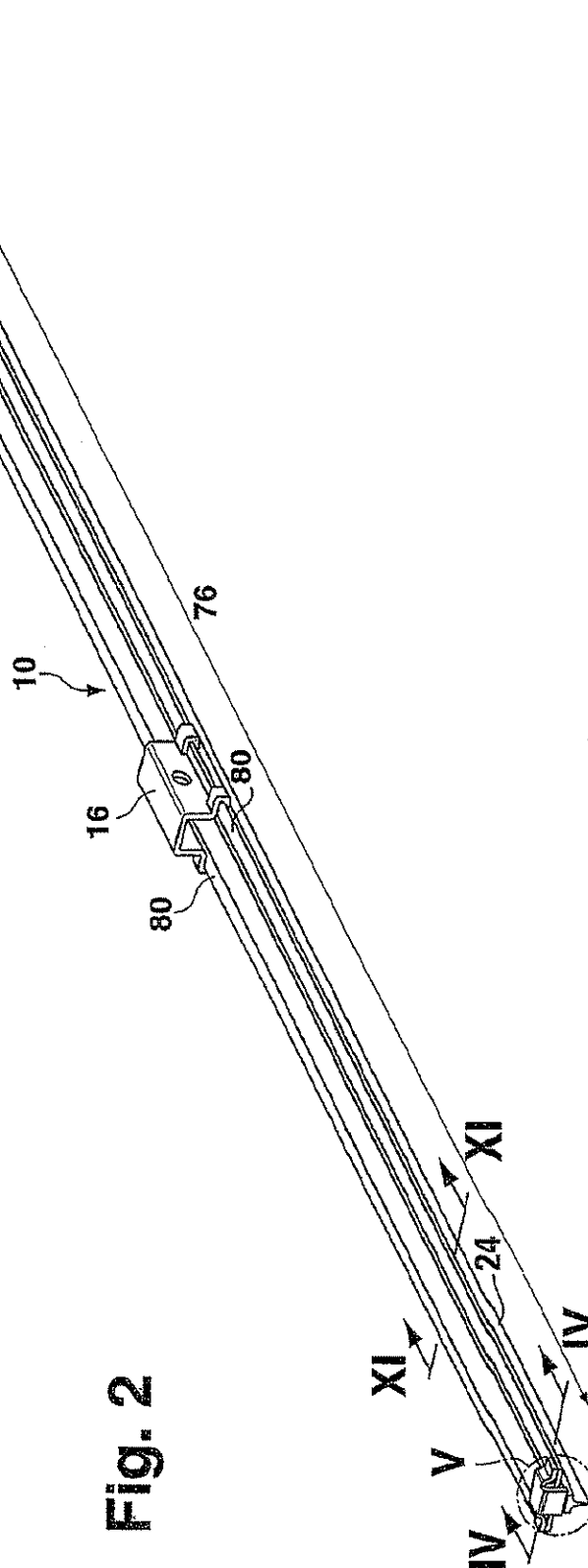
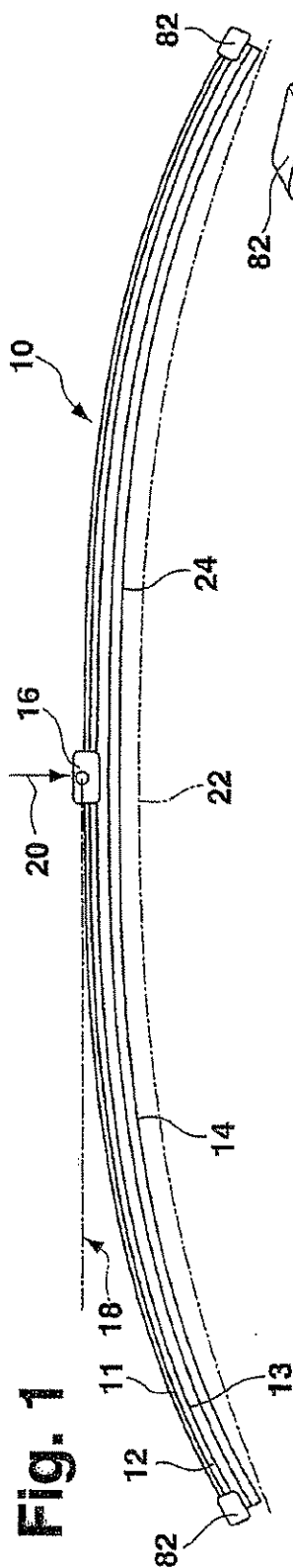
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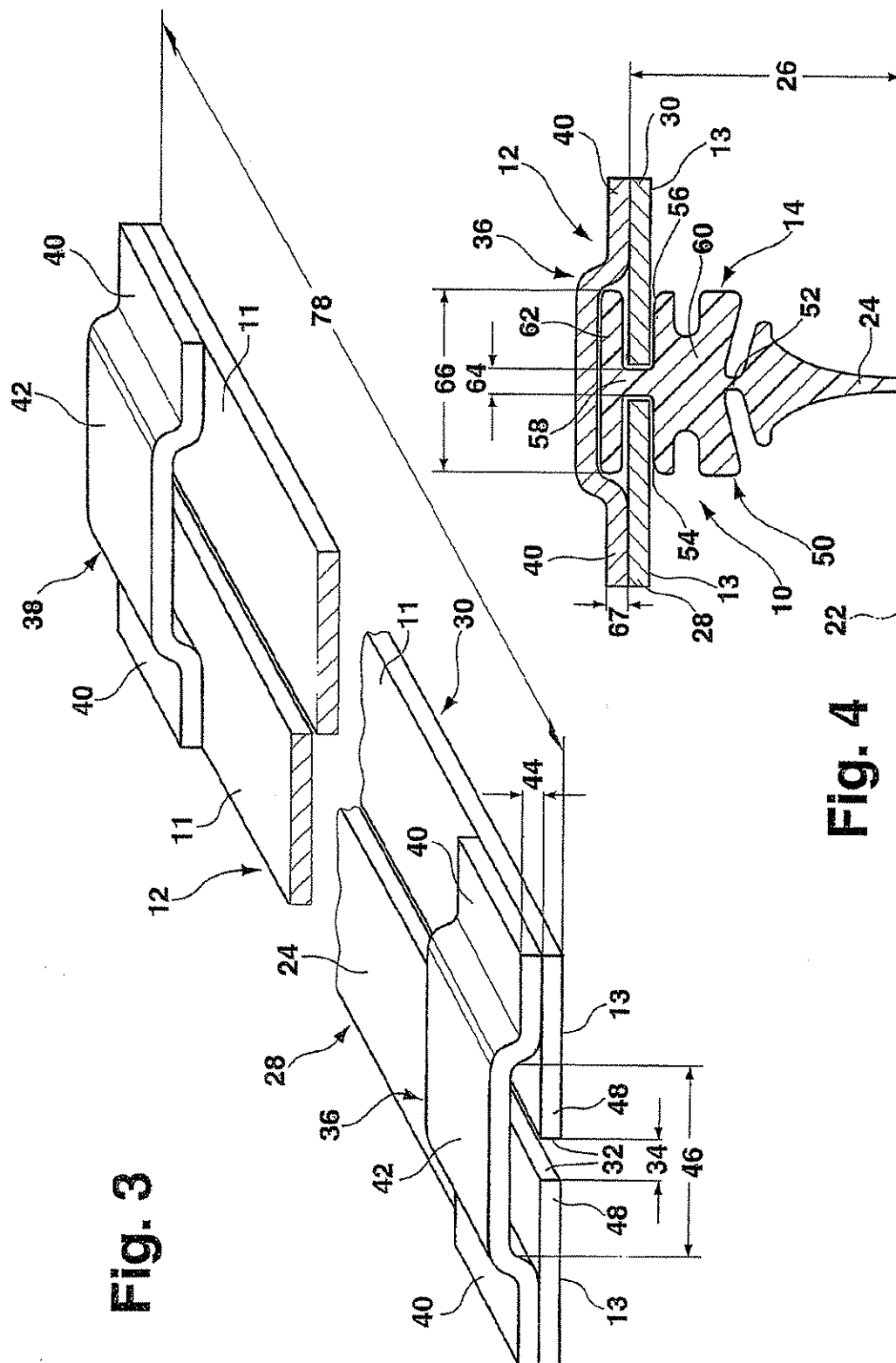


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Fig. 5

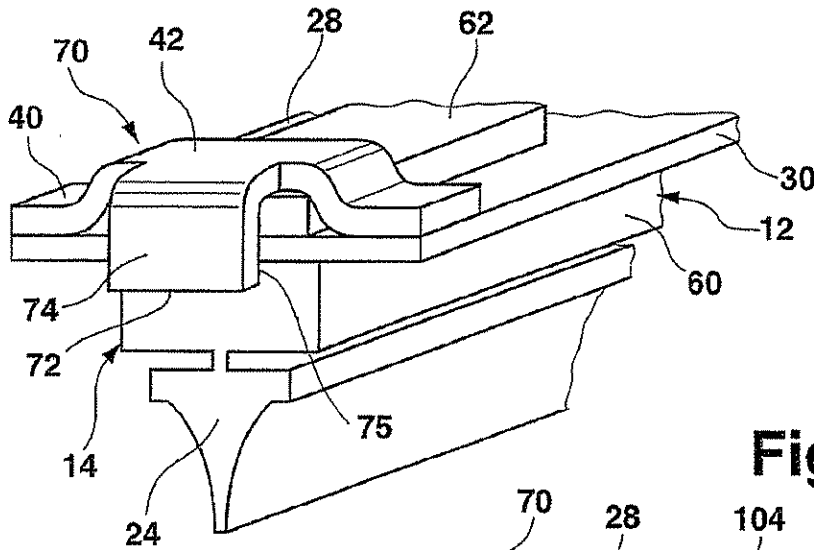


Fig. 7

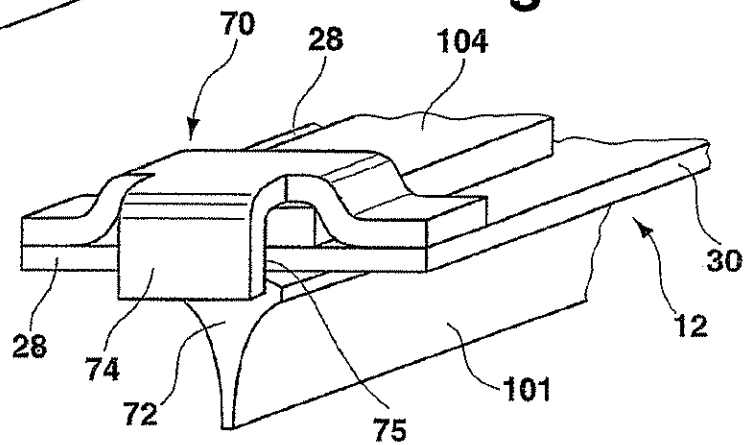


Fig. 6

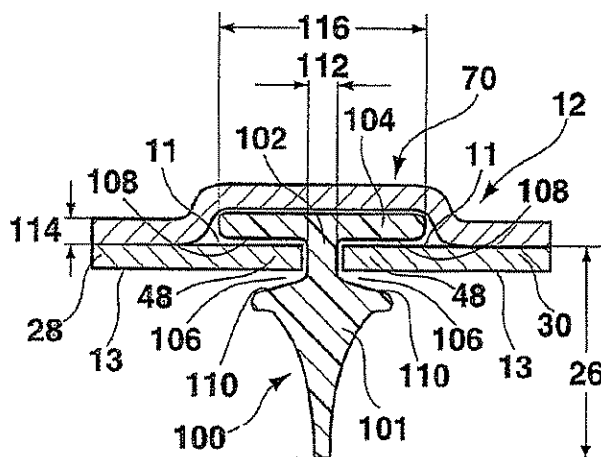
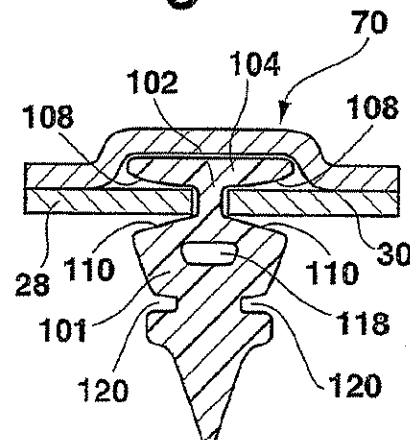


Fig. 8



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Fig. 9

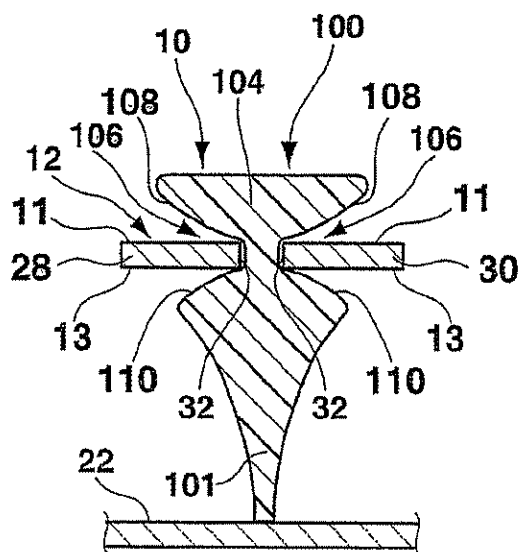


Fig. 10

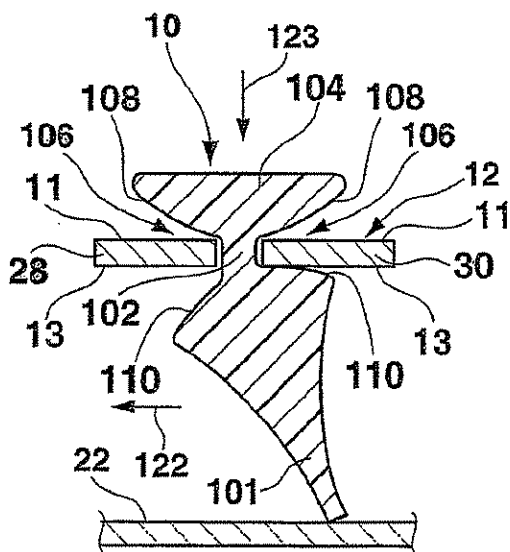
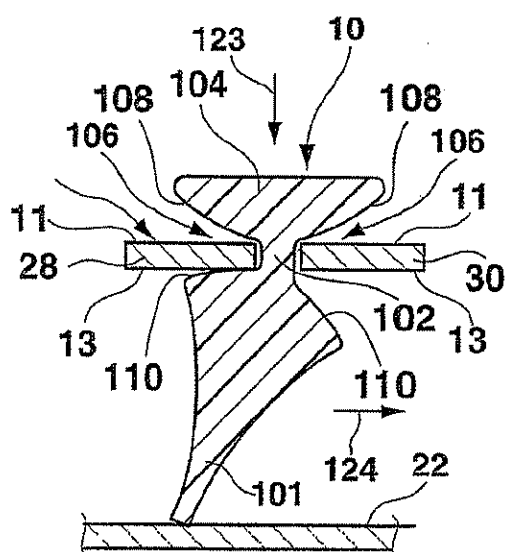


Fig. 11



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WIPER BLADE FOR CLEANING VEHICLE WINDOWS

BACKGROUND OF THE INVENTION

In common wiper blades for motor vehicles, the purpose of the support element is to assure as uniform as possible a distribution of the wiper blade pressure against the window, which pressure is exerted by a wiper arm connected to the wiper blade, over the entire wiping field wiped by the wiper blade. Through an appropriate curvature of the unloaded support element—i.e. when the wiper blade is not resting against the window—the ends of the wiper strip, which is placed completely against the window during the wiping operation of the wiper blade, are loaded toward the window by the support element, which is under tension in this state, even though the curvature radii of spherically curved vehicle windows change with each wiper blade position. The curvature of the wiper blade must therefore be somewhat sharper than the sharpest curvature measured within the wiping field on the window to be wiped. The support element consequently replaces the complex support bracket structure with two spring strips disposed in the wiper strip, as is the practice in conventional wiper blades (DE-OS 15 05 357).

In a known wiper blade (German Utility Model 29611722.6), the two spring strips are of one piece and are connected by means of crosspieces disposed at both of their ends. Since these crosspieces are disposed in the plane of the spring strips, the slot, which is disposed between the opposing longitudinal edges and is enclosed by the spring strips and the crosspieces, must open outward in its one end section so that it is possible to properly install the wiper strip in the slot. This installation opening, though, can produce disadvantageous changes in the spring properties of the support element with regard to the desired wiping results. In addition, manually inserting the wiper strip into the slot through this opening is cost-intensive.

SUMMARY OF THE INVENTION

In the wiper blade according to the invention, with the characterizing features of claim 1, it is possible, starting from one end of the support element, to insert the wiper strip in a rectilinear fashion between the two opposing longitudinal edges of the spring strip, where their inner, free edge strips protrude into the longitudinal grooves of the wiper strip. This simple installation movement can be easily executed by an automated installation machine, which achieves a considerable cost reduction. In addition, the disadvantageous installation opening of the slot can be eliminated because the bridge-like crosspieces permit the rectilinear installation motion of the wiper strip from one end of the support element.

Embodying the crosspieces as separate components that are attached to the spring strips achieves advantages in the production of the wiper blade.

For the connection between the spring strips and the crosspieces, it is useful if the crosspieces are attached to the upper band surfaces of the two spring strips.

A stable, durable connection between the spring strips and the crosspieces is achieved by welding together these separate components.

In order for the wiper blade or its wiper strip to be able to adapt in a trouble-free manner to the respective window curvature during wiper operation, it has turned out to be advantageous if the length of the spring strips is greater than

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the length of the wiper strip because then, through appropriate embodiments, a certain, advantageous longitudinal mobility of the wiper strip in relation to the support element can be assured.

A stable, low-torsion support element is produced if at least one crosspiece is disposed at each end section of the two associated spring strips. Depending on the length of the wiper blade, however, it is also quite conceivable to connect the two spring strips to each other by means of additional bridge-like crosspieces. In short wiper blades, it has turned out that placing a single crosspiece at each end section of the support element is sufficient to achieve a stable, torsion-free wiper blade.

An additional stabilization of the support element is achieved if a crosspiece disposed in the central region of the two associated spring strips is embodied as part of a connecting device for connecting the wiper blade to the wiper arm.

In a modification of the invention, at least one of the two crosspieces, which is respectively disposed at one of the end sections of the spring strips, has a stop, which is connected to its middle section and partially covers the end of the wiper strip adjacent to it. This prevents the wiper strip from creeping out of the support element in the longitudinal direction of the wiper blade.

When a crosspiece, which is provided with a stop, is respectively disposed at each of the two ends of the support element, the distance between the two stops is greater than the length of the wiper strip in order to assure a favorable adaptation of the wiper strip to the respective window curvature.

In order to reduce the danger of injury when manipulating the wiper, each crosspiece disposed at the end sections of the two spring strips is provided with a covering cap that is preferably made of plastic.

Other advantages during the wiping operation of the wiper according to the invention ensue from the fact that the thickness of a wall or intermediary strip between the two longitudinal grooves in the wiper strip is less than the distance between the adjacent longitudinal edges of the two associated spring strips. The longitudinal play of the wiper strip in the support element consequently produces a "free-floating", tension-free wiper strip that can continuously adapt to the window profile during wiper operation without being impaired by a clamped connection.

A particularly advantageous modification of the wiper blade is achieved if a wiper strip, which has a uniform cross section over its longitudinal span, has a strip-like wiper lip, which can be placed against the window and which, by means of a narrow intermediary strip that is formed by groove-like constrictions on opposite sides, is connected to a covering strip secured to the support element, and each of the two adjacent, inner longitudinal edges of the spring strips is disposed in one of the two groove-like constrictions of the wiper strip. This reduces the height of the wiper blade considerably. Because the width of the constriction groove is greater than the thickness of the spring strips in a partial region, the wiper lip can always tilt into the required drag position during wiper operation.

In this connection, it is particularly advantageous if the lateral defining surfaces of the groove-like constrictions diverge from the intermediary strip to the longitudinal sides of the wiper strip. With a corresponding matching, the spring strips can thus guide the wiper strip at the intermediary strip and simultaneously allow the wiper lip to execute its required tilting motion into the drag position.

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One modification of the invention provides that one of the lateral defining surfaces of the groove-like constrictions has a spherical curvature, viewed in cross section. This permits a favorable and quiet rolling motion of this side wall against the band surface of the relevant spring strip oriented toward it.

This advantage can be further improved if both lateral defining surfaces of the groove-like constrictions have a spherical curvature, viewed in cross section.

According to one embodiment of the invention, the wiper lip has a completely enclosed longitudinal conduit in order to encourage an optimal contact of the wiper strip against the preferably spherically curved window to be wiped.

So that it is no longer necessary to carry out particular steps to fasten a connecting device for a wiper arm that moves the wiper blade, each of the two spring strips, at least with a central edge strip, protrudes from its groove-like constriction so that the connecting device can be fastened to the free edge strips.

Other advantageous modifications and embodiments of the invention are disclosed in the following description of exemplary embodiments shown in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a wiper blade according to the invention,

FIG. 2 is a prolate depiction of the wiper blade from FIG. 1, in a perspective representation drawn to scale,

FIG. 3 shows a foreshortened, enlarged, prolate, perspective depiction of a support element associated with the wiper blade according to the invention,

FIG. 4 shows an enlargement of the sectional plane of a section along the line IV—IV in FIG. 2,

FIG. 5 shows an enlargement of a detail labeled V in FIG. 2,

FIG. 6 shows the sectional plane of a section according to FIG. 4 through another embodiment of the wiper blade according to the invention,

FIG. 7 shows the wiper blade from FIG. 6 in a detail that corresponds to FIG. 5,

FIG. 8 shows the sectional plane of a section according to FIGS. 4 and 6 through another embodiment of the wiper blade according to the invention,

FIG. 9 is a schematic representation of the sectional plane of a section along the line IX—IX in FIG. 2 through a wiper blade according to the invention, in an enlarged depiction, in which the wiper blade is placed against the window surface to be wiped,

FIG. 10 shows the wiper blade from FIG. 9 during wiper operation in one wiping direction, and

FIG. 11 shows the wiper blade from FIG. 9 during wiper operation in the other wiping direction.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A wiper blade 10 indicated in FIGS. 1 and 2 has a band-like, elongated, spring-elastic support element 12, against whose underside 13 an elongated, rubber-elastic wiper strip 14 is disposed so that their longitudinal axes are parallel. On the top side 11 of the support element 14, which is also referred to as a spring bar, the center section of the support element is provided with the wiper blade part 16 of a connecting device, with the aid of which the wiper blade 10 can be detachably connected in an articulating fashion to

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a driven wiper arm 18 indicated with a dot-and-dash line in FIG. 1. To that end, the free end of the wiper arm 18 is provided with the wiper arm part of the connecting device. The wiper arm 18 is loaded in the direction of the arrow 20 toward the window to be wiped, for example the windshield of a motor vehicle, whose surface to be wiped is indicated with a dot-and-dash line 22 in FIG. 1. Since the line 22 is intended to represent the sharpest curvature of the window surface, it is clear that the curvature of the wiper blade 10, which is not yet under tension and rests with both of its ends against the window, is sharper than the maximal window curvature (FIG. 1). Due to the pressure (arrow 20), the wiper blade 10 places its wiper lip 24 over its entire length against the window surface 22. This causes a tension to be built up in the spring-elastic support element 12, which is made of metal for example, which tension assures a uniform contact of the wiper strip 14 and the wiper lip 24 over its entire length against the window and assures a uniform distribution of the pressure.

A first embodiment of the wiper blade 10 will be explained in detail below in conjunction with FIGS. 3 to 5. FIG. 4 shows that the support element 12 of the wiper blade 10 is spaced a distance 26 apart from the window 22 to be wiped. Its position is designed so that its band surfaces 11 and 13 are disposed in a plane extending essentially parallel to the window surface 22 to be wiped. The particularly advantageous design of the support element 12 is shown particularly in FIGS. 3 and 4. It has two band-like spring strips 28 and 30 disposed in a common plane, which are aligned parallel to each other. The opposing, inner longitudinal edges 32 are spaced a distance 34 apart from each other. The spring strips 28, 30 are connected to each other at each of the two ends by means of a bridge-like crosspiece 36 and 38, for example by means of welds. In this instance, each bridge-like crosspiece rests with its end sections 40 against the top side 11 of the support element 12 or its spring strips 28, 30. Each of the two crosspieces 36 and 28 has a middle section 42 which is spaced a distance 44 apart from the upper band surface 11 of the spring strips, thereby forming the basis of its bridge-like design. Since the longitudinal span 46 of the middle sections 42 is greater than the distance 34 between the opposing inner longitudinal edges 32, the two spring strips 28 and 30 extend with inner edge strips 48 into the region of the middle sections 42, where the edge strips 48 are disposed underneath the middle sections 42, spaced apart from them by a distance 44. In addition to the above-mentioned purposes of the support element 12 with regard to contact force distribution, it should also assure a regulation-compliant, tension-free guidance of the wiper strip 14 during wiper operation. This also assures a quiet wiper operation.

The wiper strip 14 of this first embodiment has a cross section, which will be clarified in conjunction with FIG. 4. It has a top strip 50 that is connected to the wiper lip 24, which performs the actual wiping function, by means of a narrow intermediary strip 52. The disposition of the intermediary strip 52 permits the wiper lip 24 to tilt into a drag position that encourages the wiping function, which will be explained later. On its opposite longitudinal sides, the top strip 50 is provided with longitudinal grooves 54 and 56 that are open at the edges oriented toward these longitudinal sides. The longitudinal grooves 54 and 56 serve to receive the inner edge strips 48 of the spring strips 28 and 30. The depth of the longitudinal grooves 54 and 56 is selected so that a wall 58 remains between the two longitudinal grooves. The top strip 50 consequently has a main strip 60 and a covering strip 62, which are connected to each other by

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means of the wall 58. The thickness 64 of the wall 58 is less than the distance 34 between the inner longitudinal edges 32 of the spring strips 28, 30, i.e. less than the distance between their inner edge strips 48. The width of the two longitudinal grooves 54 and 56 in the top strip 50 is matched to the thickness of the spring strips 28, 30 and/or their inner edge strips 48 so that a tension-free securing of the wiper strip to the support element 12 is assured when the wiper strip according to FIG. 4 is put together with the support element 12 according to FIG. 3. Since the width 66 of the covering strip 62 is also somewhat less than the longitudinal span 46 of the middle section 42, also referred to as the bridge width, and its thickness 67 is less than the distance 44 between the middle section 42 and the top sides 11 of the spring strips 28, 30, the wiper strip 14, which has a uniform cross section over its entire longitudinal span, can easily be inserted longitudinally into the support element 12 and thus connected to it.

FIG. 5 shows another exceptional feature of the wiper blade according to the invention. This figure shows that on its side oriented toward the wiper blade end, in its middle section, the crosspiece 70 disposed at one end of the support element is provided with a stop 74, which is connected to it and which at least partially covers the end face 72 adjacent to it. The stop 74 is constituted by a tab-like projection from the middle section 42, which projection is bent at right angles. If each of the two wiper blade ends or each of the two support element ends is provided with a crosspiece 70 according to FIG. 5, care must be taken that the distance between the opposing inner walls 75 of the stop tabs 74 is slightly greater than the length 76 of the wiper strip 14 (FIG. 2). This can also be achieved, for example, by the length 78 of the support element 12 being slightly greater than the length 76 of the wiper strip 14. The placement of the stops 74 at both ends thus constitutes an effective securing means for preventing the wiper strip 14 from creeping in the longitudinal direction out of its support element 12 during wiper operation. Naturally, in such a case, at least one of the two stop tabs 74 is bent at right angles only after the wiper strip 14 is inserted into the support element 12.

The wiper arm part 16 of the connecting device, which is for the wiper arm and is disposed in the middle section of the wiper blade 10, engages around the outer edge strips 80 of the spring strips 28, 30 or the support element 12 protruding from the longitudinal grooves 54 and 56. The connection between the part 16 and the support element 12 can be produced by means of positive and/or frictional engagement. With a corresponding length of the wiper blade, it can also be useful to provide additional corresponding crosspieces between the two crosspieces 36 and 38 disposed at the ends. In order to prevent injury when the wiper blade is being manipulated, particularly by the end user, a covering cap 82 that is preferably made of plastic is disposed on the two spring strips 28, 30 or the crosspieces 36, 38 at the end, preferably connected to them in detent fashion, preferably connected to them in detent fashion (FIGS. 1 and 2).

FIGS. 6 to 8 show additional embodiments of the wiper blade according to the invention.

The support elements of these embodiments fully correspond to the support elements 12 from FIGS. 3 to 5 explained above so that the reference numerals used for them in these figures can be adopted directly. The embodiment of the wiper strip 100 in this embodiment, though, differs fundamentally from the design of the wiper strip 14 in the embodiment described above. As FIG. 6 in particular shows, the wiper strip 100 has only one wiper lip 101, which is of one piece with a covering strip 104 and is connected to

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it by means of an intermediary strip 102. The main strip 60 in the exemplary embodiment described above in conjunction with FIGS. 4 and 5 is consequently eliminated. The inner edge strips 48 of the spring strips 28 and 30 rest in groove-like constrictions 106 of the wiper strip 100, which are required to produce the narrow intermediary strip 102. Consequently, the lateral defining surface 108 of the constriction 106 embodied on the covering strip 104 is oriented toward the upper band surface 11 of the support element 12. The other lateral defining surface 110 of the groove-like constriction 106 is consequently disposed directly opposite from the lower band surface 13 of the support element 12. It is consequently clear that each of the two inner longitudinal edges 32 of the two spring strips 28, 30 or of the support element 12 is disposed in one of the two groove-like constrictions 106 of the wiper strip 100. In addition, FIG. 6 particularly shows that the two lateral defining surfaces 110 of the constrictions 106 are embodied spherically and are disposed so that the width dimension of the groove-like constrictions 106 is wider than the thickness of the spring strips 28, 30, at least over an outer partial region. It is therefore possible for the wiper lip 101 to tilt over into the desired, advantageous drag position during wiper operation. In this embodiment of the wiper blade according to the invention as well, the width 112 of the intermediary strip 102 is matched to the distance 34 between the opposing inner longitudinal edges 32 of the spring strips 28, 30 in such a way that an air gap remains between the intermediary strip and the spring strips. Here, too, the thickness 114 of the covering strip 104 is also slightly less than the distance 44 between the middle section 42 of the crosspiece 36 and the inner edge strip 48. Also, the width 116 of the covering strip 104 is slightly less than the longitudinal span 46 of the middle section 42 of the bridge-like crosspieces 36. As a result, it is possible to insert the wiper strip 100, which has a uniform cross section over its entire length, without trouble into the support element 12 over its longitudinal span so that the installation position shown in FIG. 6 is achieved. In this embodiment as well, the plane in which the support element 12 extends is spaced a distance 26 apart from the surface 22 of the window 22 to be wiped.

As described above in conjunction with FIG. 5, in this embodiment of the wiper blade according to the invention as well, each of the two bridge-like crosspieces 70, at its outer ends in the longitudinal span of the wiper blade, can be provided with a stop 74, which is bent at right angles so that after the wiper strip 14 is inserted into the support element 12 and the stop tabs 74 are bent at right angles, the wiper strip 100 is reliably assured of being longitudinally secured in the support element 12. It is clear that in this embodiment as well, the distance between the opposing inner walls 75 of the stop tabs 74 must be slightly greater than the length 76 of the wiper strip.

Another embodiment of the wiper blade according to the invention will be explained in conjunction with FIG. 8. The embodiment according to FIG. 8 corresponds in its basic design to the design of the embodiment described in conjunction with FIG. 6. In contrast to the embodiment according to FIG. 6, though, in this embodiment, not only the lateral defining surfaces 110 of the groove-like constrictions 106, but also the other lateral defining surfaces 108 embodied on the covering strip 104 are embodied spherically. The embodiment according to FIG. 8 also differs from the embodiment according to FIG. 6 by means of a continuous, completely closed longitudinal conduit 118 disposed in the wiper lip 101. The disposition of the longitudinal conduit 118 in the wiper lip can be used, by itself or in connection

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with additional longitudinal grooves, to produce a smooth, quiet tilting behavior of the wiper lip during wiper operation. In addition, its disposition is not absolutely required in connection with the spherical embodiment of the defining surfaces 108, 110.

As is clear from FIGS. 2 and 3, the width of the support element 12 is the same over its entire longitudinal span. However, it is also conceivable for the support element to taper toward the end sections of the wiper blade. In order for the part 16 to be fastened to the wiper blade, it is sufficient if each spring strip 28, 30, at least with a central, outer edge strip 80, protrudes from its groove-like constriction so that the part 16 of the connecting device can be fastened to this edge strip 80. Instead of a support element 12 according to FIG. 3, it is also conceivable for the two spring strips to be embodied as separate components and to be disposed in the groove-like constrictions of the wiper strip. The securing, in particular of the distance 34, can then be performed by other components that are not shown in detail.

FIGS. 9 to 11 show schematic sectional depictions of the wiper blade according to FIGS. 6 and 7, cut along the line IX—IX in FIG. 2; in FIG. 9, the wiper blade 10 is merely placed with its wiper lip 101 against the window surface 22 to be wiped and FIG. 9 shows the circular curved surfaces 108, 110 of the groove-like constrictions in cross-section. The wiper strip 100 is secured with play between the inner longitudinal edges 32 of the two spring strips 28, 30 (also see FIGS. 3 and 4). Since the length 76 of the wiper strip 100 is also slightly less than the length 78 of the support element 12 or is slightly less than the distance between the opposing inner walls 75 of the stops 74 at the two ends of the support element 12, this produces a so-called “free-floating”, tension-free, but operationally reliable securing of the wiper strip 100 in the support element 12.

If during wiper operation, the wiper blade 10, loaded by the pressure (arrow 20 in FIG. 1), is then moved across the window 22 in the direction of the arrow 122 in FIG. 10, then the wiper lip 101 tilts in the vicinity of the intermediary strip 102 into an advantageous drag position in which the support element 12 comes slightly closer to the window (arrow 123). The tilting motion is limited by the fact that the lateral defining surface 110 of the one groove-like constriction 106 is supported against the underside 13 of the one spring strip 30. When the wiper blade 10 has reached its reversal position and is moved by the wiper arm 18 in the opposite direction (arrow 124 in FIG. 11), the wiper lip 101 tilts through an intermediary position shown in FIG. 9, into its other drag position (FIG. 11), in which the wiper lip 101 is supported with the lateral defining surface 110 of the other groove-like constriction 106 against the underside 13 of the other spring strip 28.

When the drag positions of the wiper lip 101, close to their reversal positions—due to the usually spherical curvature of the windshield 22—approaches the window, the spherically embodied defining surfaces 110 roll silently against the undersides 13 of the spring strips 28, 30. Correspondingly, the other spherical defining surfaces 108 of the groove-like constrictions 106 can, if necessary, also roll against the top sides 11 of the spring strips 28 and 30.

What is claimed is:

1. A wiper blade (10) for windows of motor vehicles, having an elongated, rubber-elastic wiper strip (14), which can be placed against the window (22) and is connected to an elongated, spring-elastic support element (12) so that their longitudinal axes are parallel, which support element (12) is directly connected to a device for connecting the wiper blade to a driven wiper arm (18), wherein the support

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element (12) has two band-like spring strips (28, 30), which are situated in a plane that is disposed in front of the window, essentially parallel to the window, and whose, lower band surfaces (13) are oriented toward the window and whose adjacent, inner longitudinal edges (48), which are disposed spaced a distance (34) apart from each other, each protrude into a respective longitudinal groove (54, 56, or 106), which grooves are associated with each longitudinal edge and are each open toward a respective longitudinal side of the wiper strip (14), and these two spring strips (36, 38) are connected to each other by at least two crosspieces (36, 38) disposed spaced apart from each other in the longitudinal direction, wherein each crosspiece (36, 38) has a middle section (42) which extends spaced a distance (44) apart from the upper band surfaces (11) of the spring strips (28, 30), producing bridge-like crosspieces (36, 38) defining a bridgewidth, where the distance (34) between the two longitudinal strips (28, 30) is less than the bridge width (46),

wherein the crosspieces (36, 38) are attached to the upper band surfaces (11) of the two spring strips (28, 30),

wherein the crosspieces (36, 38) are welded to the two spring strips (28, 30), so that the wiper strip from an end of the support element is insertable linearly between the longitudinal edges of the spring strips facing one another, and

wherein each crosspiece (36, 38) disposed at the end sections of the two spring strips (28, 30) is provided with a covering cap (82) preferably made of plastic.

2. The wiper blade according to claim 1, wherein the crosspieces (36, 38) are embodied as separate components and are affixed to the two spring strips (28, 30).

3. The wiper blade according to claim 1, wherein the length (78) of the spring strips is greater than the length (76) of the wiper strip (14).

4. The wiper blade according to claim 1, wherein at least one crosspiece (36, 38) is disposed at each end section of the two associated spring strips (28, 30).

5. The wiper blade according to claim 4, wherein a crosspiece disposed in the middle region of the two associated spring strips (28, 30) is embodied as part (16) of the connecting device for connecting the wiper blade (10) to the wiper arm (18).

6. The wiper blade according to claim 4, wherein at least one of the two crosspieces (70) disposed at one of the respective end sections of the spring strips (28, 30) is provided with a stop (74), which is connected to its middle section (42) and partially covers the adjacent end (72) of the wiper strip.

7. The wiper blade according to claim 6, wherein the both of the crosspieces (36, 38) disposed at the ends of the support element (12) are provided with a stop (74).

8. The wiper blade according to claim 1, wherein the thickness (64) of a wall (58) provided between the two longitudinal grooves (54, 56) in the wiper strip (14) is smaller than the distance (34) between the adjacent longitudinal edges (32) of the two associated spring strips (28, 30).

9. The wiper blade according to claim 1, wherein the wiper strip (100), which has a uniform cross section over its longitudinal span, has a strip-like wiper lip (101), which can be placed against the window and which, by means of a narrow intermediary strip (102) that is formed by groove-like constrictions (106) on opposite sides, is connected to a covering strip (104) secured to the support element (12), and in that each of the two adjacent inner longitudinal edges (32) of the spring strips (28, 30) is disposed in one of the two groove-like constrictions (106) of the wiper strip (100).

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10. The wiper blade according to claim 9, wherein the lateral defining surfaces (108, 110) of the groove-like constrictions (106) diverge from the intermediary strip (102) to the longitudinal sides of the wiper strip.

11. The wiper blade according to claim 10, wherein one lateral defining surface (110) of the groove-like constrictions (106) has a circular curvature, viewed in cross section.

12. The wiper blade according to claim 9, wherein the wiper lip (101) is provided with a completely closed longitudinal conduit (118).

13. The wiper blade according to claim 9, wherein each spring strip (28, 30), at least with a central edge strip, protrudes from its groove-like constriction (106).

14. A wiper blade (10) for windows of motor vehicles, having an elongated, rubber-elastic wiper strip (14), which can be placed against the window (22) and is connected to an elongated, spring-elastic support element (12) so that their longitudinal axes are parallel, which support element (12) is directly connected to a device for connecting the wiper blade to a driven wiper arm (18), wherein the support element (12) has two band-like spring strips (28, 30), which are situated in a plane that is disposed in front of the window, essentially parallel to the window, and whose, lower band surfaces (13) are oriented toward the window and whose adjacent, inner longitudinal edges (48), which are disposed spaced a distance (34) apart from each other, each protrude into a respective longitudinal groove (54, 56, or 106), which grooves are associated with each longitudinal edge and are each open toward a respective longitudinal side of the wiper strip (14), and these two spring strips (36, 38) are connected to each other by at least two crosspieces (36, 38) disposed spaced apart from each other in the longitudinal direction, wherein each crosspiece (36, 38) has a middle section (42) which extends spaced a distance (44) apart from the upper band surfaces (11) of the spring strips (28, 30), producing bridge-like crosspieces defining a bridge width, wherein the distance (34) between the two longitudinal strips (28, 30) is less than the bridge width (46),

wherein the crosspieces (36, 38) are attached to the upper band surfaces (11) of the two spring strips (28, 30), wherein the crosspieces (36, 38) are welded to the two spring strips (28, 30), so that the wiper strip from an end of the support element is insertable linearly between the longitudinal edges of the spring strips facing one another,

wherein the wiper strip (100), which has a uniform cross section over its longitudinal span, has a strip-like wiper lip (101), which can be placed against the window and which, by means of a narrow intermediary strip (102) that is formed by groove-like constrictions (106) on opposite sides, is connected to a covering strip (104) secured to the support element (12), and wherein each of the two adjacent inner longitudinal edges (32) of the spring strips (28, 30) is disposed in one of the two groove-like constrictions (106) of the wiper strip (100),

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wherein the lateral defining surfaces (108, 110) of the groove-like constrictions (106) diverge from the intermediary strip (102) to the longitudinal sides of the wiper strip, and

wherein both lateral defining surfaces (108, 110) of the groove-like constrictions (106) have a circular curvature, viewed in cross section.

15. A wiper blade (10) for windows of motor vehicles, comprising:

an elongated, rubber-elastic wiper strip (14), which can be placed against the window (22) and is connected to an elongated, spring-elastic support element (12) so that their longitudinal axes are parallel, which support element (12) is directly connected to a device for connecting the wiper blade to a driven wiper arm (18), wherein the support element (12) has two band-like spring strips (28, 30), which are situated in a plane that is disposed in front of the window, essentially parallel to the window, and whose, lower band surfaces (13) are oriented toward the window and whose adjacent, inner longitudinal edges (48), which are disposed spaced a distance (34) apart from each other, each protrude into a respective longitudinal groove (54, 56, or 106), which grooves are associated with each longitudinal edge and are each open toward a respective longitudinal side of the wiper strip (14), and these two spring strips (36, 38) are connected to each other by at least two crosspieces (36, 38) disposed spaced apart from each other in the longitudinal direction, wherein each crosspiece (36, 38) has a middle section (42) which extends spaced a distance (44) apart from the upper band surfaces (11) of the spring strips (28, 30), producing bridge-like crosspieces (36, 38) defining a bridge with, where the distance (34) between the two longitudinal strips (28, 30) is less than the bridge width (46),

wherein the wiper strip (100), which has a uniform cross section over its longitudinal span, has a strip-like wiper lip (101), which can be placed against the window and which, by means of a narrow intermediary strip (102) that is formed by groove-like constrictions (106) on opposite sides, is connected to a covering strip (104) secured to the support element (12), and in that each of the two adjacent inner longitudinal edges (32) of the spring strips (28, 30) is disposed in one of groove-like constrictions (106) of the wiper strip (100),

wherein the lateral defining surfaces (108, 110) of the groove-like constrictions (106) diverge from the intermediary strip (102) to the longitudinal sides of the wiper strip and

wherein both lateral defining surfaces (108, 110) of the groove-like constrictions (106) have a circular curvature, viewed in cross section.

* * * * *

JS 44 (Rev. 12/07)

CIVIL COVER SHEET

The JS 44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE REVERSE OF THE FORM.)

I. (a) PLAINTIFFS

Robert Bosch LLC

(b) County of Residence of First Listed Plaintiff _____
(EXCEPT IN U.S. PLAINTIFF CASES)

(c) Attorney's (Firm Name, Address, and Telephone Number)
Richard L. Horwitz (#2246)/David E. Moore (#3983)
Potter Anderson & Corroon LLP
1313 N. Market Street Wilmington, Delaware 19801 (302) 984-6000

DEFENDANTS

Pylon Manufacturing Corp.

County of Residence of First Listed Defendant _____
(IN U.S. PLAINTIFF CASES ONLY)

NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE
LAND INVOLVED.

Attorneys (If Known)

II. BASIS OF JURISDICTION (Place an "X" in One Box Only)

- ☐ 1 U.S. Government Plaintiff ☒ 3 Federal Question (U.S. Government Not a Party)
- ☐ 2 U.S. Government Defendant ☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES (Place an "X" in One Box for Plaintiff and One Box for Defendant)

- | | | | | | |
|-----------------------------------------|----------------------------|----------------------------|---------------------------------------------------------------|----------------------------|----------------------------|
| | PTF | DEF | | PTF | DEF |
| Citizen of This State | <input type="checkbox"/> 1 | <input type="checkbox"/> 1 | Incorporated or Principal Place of Business In This State | <input type="checkbox"/> 4 | <input type="checkbox"/> 4 |
| Citizen of Another State | <input type="checkbox"/> 2 | <input type="checkbox"/> 2 | Incorporated and Principal Place of Business In Another State | <input type="checkbox"/> 5 | <input type="checkbox"/> 5 |
| Citizen or Subject of a Foreign Country | <input type="checkbox"/> 3 | <input type="checkbox"/> 3 | Foreign Nation | <input type="checkbox"/> 6 | <input type="checkbox"/> 6 |

IV. NATURE OF SUIT (Place an "X" in One Box Only)

CONTRACT	TORTS	FORFEITURE/PENALTY	BANKRUPTCY	OTHER STATUTES
<input type="checkbox"/> 110 Insurance <input type="checkbox"/> 120 Marine <input type="checkbox"/> 130 Miller Act <input type="checkbox"/> 140 Negotiable Instrument <input type="checkbox"/> 150 Recovery of Overpayment & Enforcement of Judgment <input type="checkbox"/> 151 Medicare Act <input type="checkbox"/> 152 Recovery of Overpayment Student Loans (Excl. Veterans) <input type="checkbox"/> 153 Recovery of Overpayment of Veteran's Benefits <input type="checkbox"/> 160 Stockholders' Suits <input type="checkbox"/> 190 Other Contract <input type="checkbox"/> 195 Contract Product Liability <input type="checkbox"/> 196 Franchise	PERSONAL INJURY <input type="checkbox"/> 310 Airplane <input type="checkbox"/> 315 Airplane Product Liability <input type="checkbox"/> 320 Assault, Libel & Slander <input type="checkbox"/> 330 Federal Employers' Liability <input type="checkbox"/> 340 Marine <input type="checkbox"/> 345 Marine Product Liability <input type="checkbox"/> 350 Motor Vehicle <input type="checkbox"/> 355 Motor Vehicle Product Liability <input type="checkbox"/> 360 Other Personal Injury PERSONAL INJURY <input type="checkbox"/> 362 Personal Injury - Med. Malpractice <input type="checkbox"/> 365 Personal Injury - Product Liability <input type="checkbox"/> 368 Asbestos Personal Injury Product Liability PERSONAL PROPERTY <input type="checkbox"/> 370 Other Fraud <input type="checkbox"/> 371 Truth in Lending <input type="checkbox"/> 380 Other Personal Property Damage <input type="checkbox"/> 385 Property Damage Product Liability	<input type="checkbox"/> 610 Agriculture <input type="checkbox"/> 620 Other Food & Drug <input type="checkbox"/> 625 Drug Related Seizure of Property 21 USC 881 <input type="checkbox"/> 630 Liquor Laws <input type="checkbox"/> 640 R.R. & Truck <input type="checkbox"/> 650 Airline Regs. <input type="checkbox"/> 660 Occupational Safety/Health <input type="checkbox"/> 690 Other LABOR <input type="checkbox"/> 710 Fair Labor Standards Act <input type="checkbox"/> 720 Labor/Mgmt. Relations <input type="checkbox"/> 730 Labor/Mgmt. Reporting & Disclosure Act <input type="checkbox"/> 740 Railway Labor Act <input type="checkbox"/> 790 Other Labor Litigation <input type="checkbox"/> 791 Empl. Ret. Inc. Security Act IMMIGRATION <input type="checkbox"/> 462 Naturalization Application <input type="checkbox"/> 463 Habeas Corpus - Alien Detainee <input type="checkbox"/> 465 Other Immigration Actions	<input type="checkbox"/> 422 Appeal 28 USC 158 <input type="checkbox"/> 423 Withdrawal 28 USC 157 PROPERTY RIGHTS <input type="checkbox"/> 820 Copyrights <input checked="" type="checkbox"/> 830 Patent <input type="checkbox"/> 840 Trademark SOCIAL SECURITY <input type="checkbox"/> 861 HIA (1395ff) <input type="checkbox"/> 862 Black Lung (923) <input type="checkbox"/> 863 DIWC/DIWW (405(g)) <input type="checkbox"/> 864 SSID Title XVI <input type="checkbox"/> 865 RSI (405(g)) FEDERAL TAX SUITS <input type="checkbox"/> 870 Taxes (U.S. Plaintiff or Defendant) <input type="checkbox"/> 871 IRS—Third Party 26 USC 7609	<input type="checkbox"/> 400 State Reapportionment <input type="checkbox"/> 410 Antitrust <input type="checkbox"/> 430 Banks and Banking <input type="checkbox"/> 450 Commerce <input type="checkbox"/> 460 Deportation <input type="checkbox"/> 470 Racketeer Influenced and Corrupt Organizations <input type="checkbox"/> 480 Consumer Credit <input type="checkbox"/> 490 Cable/Sat TV <input type="checkbox"/> 810 Selective Service <input type="checkbox"/> 850 Securities/Commodities/Exchange <input type="checkbox"/> 875 Customer Challenge 12 USC 3410 <input type="checkbox"/> 890 Other Statutory Actions <input type="checkbox"/> 891 Agricultural Acts <input type="checkbox"/> 892 Economic Stabilization Act <input type="checkbox"/> 893 Environmental Matters <input type="checkbox"/> 894 Energy Allocation Act <input type="checkbox"/> 895 Freedom of Information Act <input type="checkbox"/> 900 Appeal of Fee Determination Under Equal Access to Justice <input type="checkbox"/> 950 Constitutionality of State Statutes
REAL PROPERTY <input type="checkbox"/> 210 Land Condemnation <input type="checkbox"/> 220 Foreclosure <input type="checkbox"/> 230 Rent Lease & Ejectment <input type="checkbox"/> 240 Torts to Land <input type="checkbox"/> 245 Tort Product Liability <input type="checkbox"/> 290 All Other Real Property	CIVIL RIGHTS <input type="checkbox"/> 441 Voting <input type="checkbox"/> 442 Employment <input type="checkbox"/> 443 Housing/Accommodations <input type="checkbox"/> 444 Welfare <input type="checkbox"/> 445 Amer. w/Disabilities - Employment <input type="checkbox"/> 446 Amer. w/Disabilities - Other <input type="checkbox"/> 440 Other Civil Rights	PRISONER PETITIONS <input type="checkbox"/> 510 Motions to Vacate Sentence Habeas Corpus: <input type="checkbox"/> 530 General <input type="checkbox"/> 535 Death Penalty <input type="checkbox"/> 540 Mandamus & Other <input type="checkbox"/> 550 Civil Rights <input type="checkbox"/> 555 Prison Condition		

V. ORIGIN

- (Place an "X" in One Box Only)
- ☒ 1 Original Proceeding ☐ 2 Removed from State Court ☐ 3 Remanded from Appellate Court ☐ 4 Reinstated or Reopened ☐ 5 Transferred from another district (specify) ☐ 6 Multidistrict Litigation ☐ 7 Appeal to District Judge from Magistrate Judgment

VI. CAUSE OF ACTION

Cite the U.S. Civil Statute under which you are filing (Do not cite jurisdictional statutes unless diversity):
 Patent infringement arising from 35 U.S.C. § 1, et. seq., §§ 271, 281, 283, 284, and 285 and Lanham Act 15 U.S.C. § 1125
 Brief description of cause:
 Infringement of U.S. Patents No. 6,292,974; No. 6,675,434; No. 6,944,905; No. 6,978,512

VII. REQUESTED IN COMPLAINT:

☐ CHECK IF THIS IS A CLASS ACTION UNDER F.R.C.P. 23 **DEMAND \$** _____
 CHECK YES only if demanded in complaint:
JURY DEMAND: ☒ Yes ☐ No

VIII. RELATED CASE(S) IF ANY

(See instructions):

JUDGE _____

DOCKET NUMBER _____

DATE

8/25/08

SIGNATURE OF ATTORNEY OF RECORD

FOR OFFICE USE ONLY

RECEIPT # _____ AMOUNT _____ APPLYING IFP _____ JUDGE _____ MAG. JUDGE _____

INSTRUCTIONS FOR ATTORNEYS COMPLETING CIVIL COVER SHEET FORM JS 44**Authority For Civil Cover Sheet**

The JS 44 civil cover sheet and the information contained herein neither replaces nor supplements the filings and service of pleading or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. Consequently, a civil cover sheet is submitted to the Clerk of Court for each civil complaint filed. The attorney filing a case should complete the form as follows:

I. (a) Plaintiffs-Defendants. Enter names (last, first, middle initial) of plaintiff and defendant. If the plaintiff or defendant is a government agency, use only the full name or standard abbreviations. If the plaintiff or defendant is an official within a government agency, identify first the agency and then the official, giving both name and title.

(b) County of Residence. For each civil case filed, except U.S. plaintiff cases, enter the name of the county where the first listed plaintiff resides at the time of filing. In U.S. plaintiff cases, enter the name of the county in which the first listed defendant resides at the time of filing. (NOTE: In land condemnation cases, the county of residence of the "defendant" is the location of the tract of land involved.)

(c) Attorneys. Enter the firm name, address, telephone number, and attorney of record. If there are several attorneys, list them on an attachment, noting in this section "(see attachment)".

II. Jurisdiction. The basis of jurisdiction is set forth under Rule 8(a), F.R.C.P., which requires that jurisdictions be shown in pleadings. Place an "X" in one of the boxes. If there is more than one basis of jurisdiction, precedence is given in the order shown below.

United States plaintiff. (1) Jurisdiction based on 28 U.S.C. 1345 and 1348. Suits by agencies and officers of the United States are included here.

United States defendant. (2) When the plaintiff is suing the United States, its officers or agencies, place an "X" in this box.

Federal question. (3) This refers to suits under 28 U.S.C. 1331, where jurisdiction arises under the Constitution of the United States, an amendment to the Constitution, an act of Congress or a treaty of the United States. In cases where the U.S. is a party, the U.S. plaintiff or defendant code takes precedence, and box 1 or 2 should be marked.

Diversity of citizenship. (4) This refers to suits under 28 U.S.C. 1332, where parties are citizens of different states. When Box 4 is checked, the citizenship of the different parties must be checked. (See Section III below; federal question actions take precedence over diversity cases.)

III. Residence (citizenship) of Principal Parties. This section of the JS 44 is to be completed if diversity of citizenship was indicated above. Mark this section for each principal party.

IV. Nature of Suit. Place an "X" in the appropriate box. If the nature of suit cannot be determined, be sure the cause of action, in Section VI below, is sufficient to enable the deputy clerk or the statistical clerks in the Administrative Office to determine the nature of suit. If the cause fits more than one nature of suit, select the most definitive.

V. Origin. Place an "X" in one of the seven boxes.

Original Proceedings. (1) Cases which originate in the United States district courts.

Removed from State Court. (2) Proceedings initiated in state courts may be removed to the district courts under Title 28 U.S.C., Section 1441. When the petition for removal is granted, check this box.

Remanded from Appellate Court. (3) Check this box for cases remanded to the district court for further action. Use the date of remand as the filing date.

Reinstated or Reopened. (4) Check this box for cases reinstated or reopened in the district court. Use the reopening date as the filing date.

Transferred from Another District. (5) For cases transferred under Title 28 U.S.C. Section 1404(a). Do not use this for within district transfers or multidistrict litigation transfers.

Multidistrict Litigation. (6) Check this box when a multidistrict case is transferred into the district under authority of Title 28 U.S.C. Section 1407. When this box is checked, do not check (5) above.

Appeal to District Judge from Magistrate Judgment. (7) Check this box for an appeal from a magistrate judge's decision.

VI. Cause of Action. Report the civil statute directly related to the cause of action and give a brief description of the cause. **Do not cite jurisdictional statutes unless diversity.** Example: U.S. Civil Statute: 47 USC 553

Brief Description: Unauthorized reception of cable service

VII. Requested in Complaint. Class Action. Place an "X" in this box if you are filing a class action under Rule 23, F.R.Cv.P.

Demand. In this space enter the dollar amount (in thousands of dollars) being demanded or indicate other demand such as a preliminary injunction.

Jury Demand. Check the appropriate box to indicate whether or not a jury is being demanded.

VIII. Related Cases. This section of the JS 44 is used to reference related pending cases if any. If there are related pending cases, insert the docket numbers and the corresponding judge names for such cases.

Date and Attorney Signature. Date and sign the civil cover sheet.